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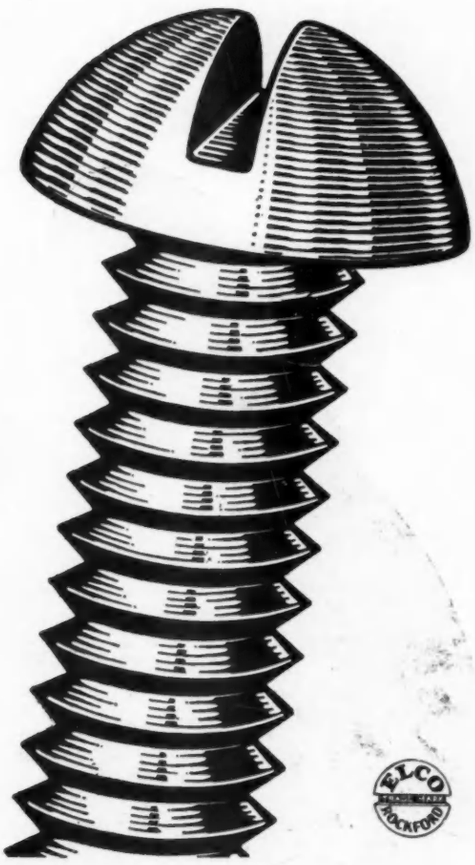

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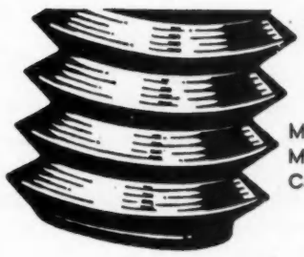

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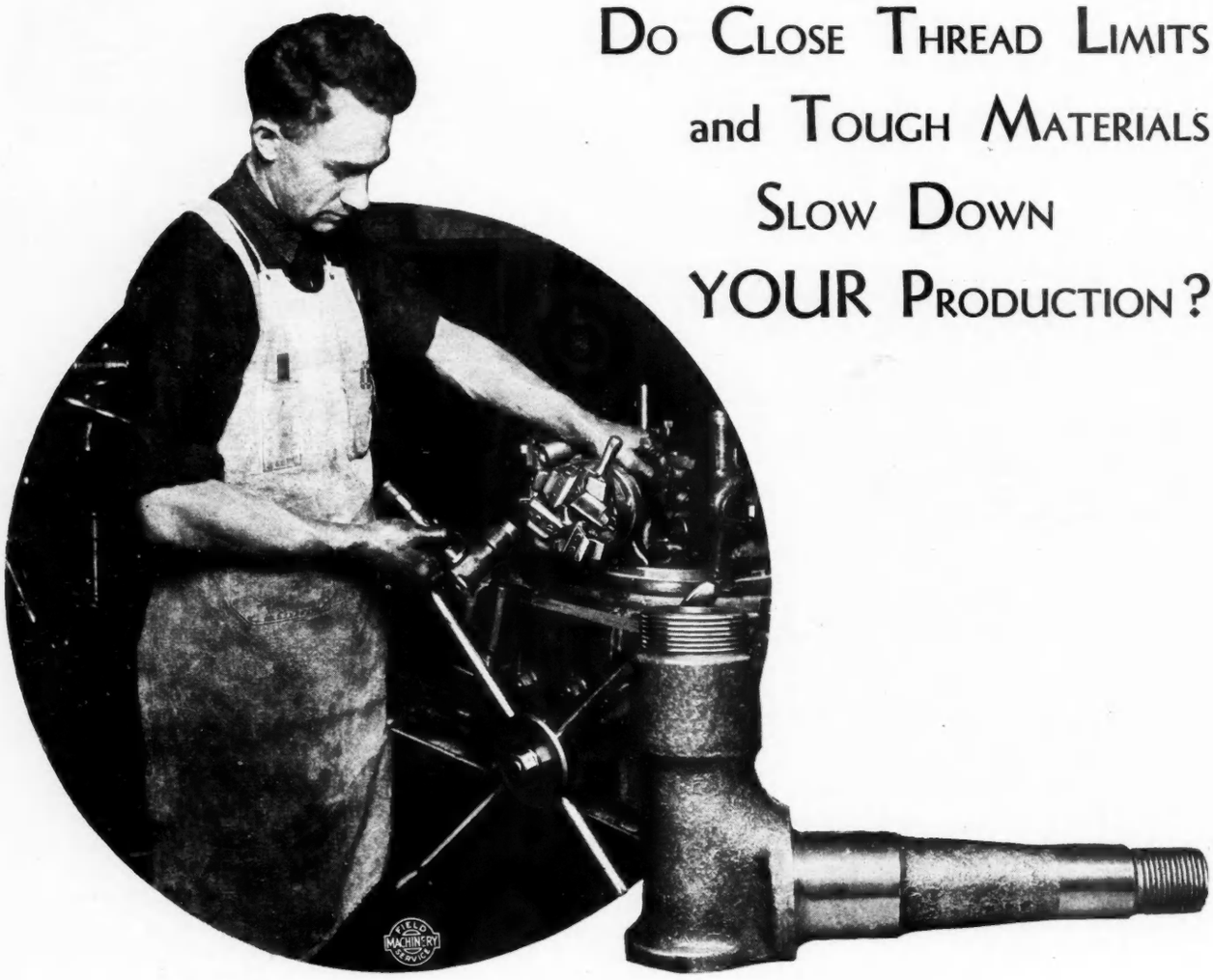

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AUTOMOTIVE INDUSTRIES

Vol. 66, No. 17 • THIRTY-THIRD YEAR • April 23, 1932

Banish Gloom; Progress is Ahead

by
C. A.
Musselman

President
Chilton Class
Journal Co.

DO manufacturers realize that the vast army of America's greatest salesmen today are selling one thing and one thing only—GLOOM?

Sales and advertising made America the great country that it was and still is; but all sales efforts today are directed into wrong channels, and salesmen everywhere are selling what they think their customers want—GLOOM.

Can prosperity return by pegging any special date, if we are still going to advertise and sell GLOOM? Can prosperity return if every manufacturer is going to wait for his neighbor to do what he should do? Isn't it every business man's job to have a sales conference immediately and explain that what his sales staff has to sell is the future of the world's greatest country—and not GLOOM? Isn't it every business man's job to contribute to this cause by advertising, no matter how modestly, to show that the tide is turning, and that we are going to stop manufacturing, wholesaling and retailing only one product—GLOOM?

As long as we go merrily "glooming" through life, and everyone wants to propagandize it, merchandise it and subsidize it, America's one effort and one product will be GLOOM.

This condition can never be changed by waiting for the more noble souls in other organizations to lead the way. It is everybody's job, not for tomorrow, but for today.

Buick-Olds-Pontiac Sales Co. Cut to

Five regional offices and 28 zone offices will direct the work of 300 sales and service representatives. Cars and parts will be distributed from warehouses in each zone. Series of dealer conferences will explain plan

Who's Who in Buick-Olds-Pontiac

R. H. GRANT, vice-president in charge of sales; also vice-president of General Motors and chairman of sales managers' committee. Formerly vice-president and sales manager of Chevrolet.

W. A. BLEES, general sales manager; formerly Pontiac vice-president in charge of sales and one time president of Motor Accounting.

R. K. WHITE, assistant general sales manager; formerly assistant general sales manager of Pontiac.

G. H. WALLACE, assistant general sales manager; formerly assistant general sales manager of Buick.

A. H. BARTSCH, general parts and service manager; one time American Bosch sales manager, then with General Motors Export and most recently on the general sales staff of General Motors at Detroit.

J. T. COLLINS, director of company owned retail stores; formerly Olds general sales manager.

D. P. BROTHER, director of advertising; formerly director of advertising section of General Motors.

J. E. GRIMM, JR., Buick advertising manager; one time Chevrolet advertising manager and most recently on General Motors general sales staff.

R. M. W. SHAW continues as advertising manager of Oldsmobile.

R. H. WHITE continues as advertising manager of Pontiac.

L. K. AUSTIN, advertising department production; formerly with Chevrolet.

E. J. POAG, sales promotion manager of Buick; formerly Buick advertising manager.

W. C. HERRING, sales promotion manager of Olds; formerly general sales manager of General Motors of Canada.

W. R. HUBER continues as Pontiac sales promotion manager.

Sales promotion staff members include A. L. Jordan, Buick; B. E. Greene, Olds; G. D. Burns, Pontiac, and D. H. Odell who comes from Frigidaire.

On the parts and service staff under Mr. Bartsch are C. W. Jacobs, T. O. Moss, A. R. Boscow, H. P. Stewart, H.V. Sweet, W. L. Barth and L. K. Marshal.

W. T. WHALEN, in charge of dealer business management, formerly assistant general sales manager of Oldsmobile. His staff consists of A. C. S. Olson on Pontiac, George Stableford on Olds, and R. W. Miller on Buick.

W. I. GIBSON, manager of schedules and car distribution; formerly with Chevrolet and Pontiac. Assisted by O. V. Klemm.

R. F. SCHREITMUELLER, manager of organization and analyzation department, formerly with General Motors Sales Section. His staff consists of A. S. Wood, C. T. Anderson, A. G. Fritz and J. L. Johnson.

A VIRTUAL duplication of the Chevrolet regional and zone set-up so far as personnel and method of operation are concerned—this briefly describes the field sales organization which is rapidly being whipped into shape by R. H. Grant, vice-president in charge of sales, and W. A. Blees, general sales manager of the Buick-Olds-Pontiac Sales Co., the formation of which was announced in the March 26 number of *Automotive Industries*. The headquarters of the new company are in the General Motors Building, Detroit.

Regional headquarters are being established in New York, Detroit, Chicago, Memphis and Oakland, Calif., and these five regions are being further subdivided into 28 zones. Three hundred sales and service representatives are being assigned to work out of the zones offices, an average of about 10 per zone. Twenty-eight zone warehouses for the wholesale distribution of cars and parts also are being located at strategic points.

Dealer conferences at which the new set-up was presented, were held during April in Detroit, Chicago, Indianapolis, New York, Cincinnati, Cleveland, Boston, Philadelphia, Washington, Pittsburgh, St. Louis, Kansas City, Lincoln and Denver. During the early part of May similar conferences will be held in Buffalo, Memphis, Oklahoma City, Dallas, San Antonio, Portland, Ore., San Francisco, Los Angeles, El Paso and Minneapolis.

The April conferences appear to have been held primarily to dispel any fears of developments unfavorable to them which the creation of the new sales company might have occasioned in the minds of dealers. It was stated, we are informed, that about May 1 a letter would go out from headquarters to all dealers handling these three lines which would contain policy announcements of a nature which dealers would welcome. No inkling was given of what these policies would be. Buick dealers were informed that instead of being paid annually their contingent quantity discounts would be available quarterly. It was also stated that no price increases were contemplated. Existing Buick and Olds distributorships were also assured that their status would not be affected by the new set-up so long as they continued to function efficiently.

So far as dealers are concerned, among the important effects of the new set-up will be:

1. Dealers handling these three lines in the future will receive the same sort of intensive factory supervision and assistance that have been afforded Chevrolet dealers for several years past.

2. Creation of zone car and parts warehouses should make it possible for dealers to get by on smaller inventories. In addition, warehouse stocks of new cars should help smaller dealers, particularly to take fuller advantage of the full line of body styles and color options than they have been able to do in the past because of inventory limitations.

3. Where sales volume does not warrant exclusive

Chevrolet Pattern, With Few Changes

representation, centralization of sales control will facilitate consolidation of two or all three franchises in one dealership.

"It will be our policy," Mr. Grant said in connection with the last point, "to have exclusive Buick, Oldsmobile and Pontiac dealerships in just as many instances as possible. As there is a much higher potential for sales of all cars in big cities than in smaller ones, we can state, as a generality, that we will probably carry exclusive accounts at key point towns and make combinations in smaller places where desirable. There will be no hard and fast rules covering this subject and each city and each dealership will have to be analyzed individually. We will carry on as we have in the past with exception that, when it becomes of interest to all parties concerned to make combinations, we will have the flexibility to do so without delay.

"In planning our dealer representation, it will be our aim to plan our franchises on the best money-

B-O-P Regional and Zone Managers

REGIONAL MANAGERS

H. J. C. Miller, New York City, Eastern Region
W. F. Hufstader, Chicago, Central Region
E. N. Steger, Detroit, Home Office Region
G. C. Gillespie, Memphis, Southern Region
R. L. Myers, Oakland, Calif., Western Region

ZONE MANAGERS

J. M. Wilson, Atlanta
F. C. Sibley, Boston
F. O. Murphy, Buffalo
L. A. Folger, Charlotte, N. C.
D. U. Bathrick, Chicago
C. L. Alexander, Cincinnati
W. L. Pavlovski, Cleveland
A. Wright, Dallas
R. W. Losey, Denver
James Dickson, Jr., Detroit
J. B. Hancock, El Paso
G. J. Gates, Great Falls, Mont.
L. C. Burnett, Indianapolis
P. B. Divver, Jacksonville
W. A. Rea, Kansas City
C. W. Mellen, Lincoln, Neb.
G. R. Jones, Los Angeles
F. J. Ackerman, Memphis
O. L. Waller, Minneapolis
A. E. DeLoach, New York City
L. H. Kurtz, Oakland, Calif.
W. J. Bryan, Oklahoma City
J. J. Costello, Philadelphia
T. W. Minor, Pittsburgh
M. O. Anderson, Portland, Ore.
G. Gamble, San Antonio
H. A. Trevellyan, St. Louis
R. C. Gilmer, Washington, D. C.

Map at right shows regional and zone office locations set by the B-O-P Sales Co. Regional boundaries are outlined. Zone boundaries have not yet been announced

U. S. REGISTRATIONS

	1929	1930	1931
Buick	172,307	122,656	90,873
Olds	93,483	50,510	46,983
Oakland-Pontiac	190,104	90,037	86,133
Total	455,894	263,203	223,989
Per cent of total all makes	11.76	10.03	11.74

making basis that we can devise, taking the individual territory, the personality and the financial strength of the individual dealer into consideration.

"Where we now have dual dealerships, or at such points as we may create them in the future—when everyone's equities have been given consideration—I should like to point out that such General Motors dealers will be working under the direction of one management and in this way we should avoid the confusion that naturally comes up when a dealer is contacted by more than one factory organization."

The zone office set-up generally will include a zone manager, assistant zone manager, car distributor, service manager, sales promotion manager, accounting manager, field sales representatives, service representatives to shoot trouble and adjust complaints, and mechanical school instructors. In addition, in multiple dealer cities there probably will be a city sales manager and, at some points also, dealer organization managers who will be responsible mainly for closing open dealer points. The major point of divergence from the Chevrolet set-up will be that in the new organization there will be a greater number of technical men because three lines of cars, instead of one, must be taken care of.

The functions of the various individuals, it will be noted, are highly specialized in character, a move made possible by the merging of the sales activities of the three units. With a potential in normal times of 350,000 units annually and a dealer organization of about 6500, such a comprehensive field organization is possible, where the individual units themselves would not have been able to sustain economically such a group of specialists.

Sales of parts and accessories, as well as cars, for the three divisions are centralized in the new organization and future dealer contracts will be with the new company rather than with the individual division.

The service organization in the home office is headed by A. H. Bartsch as general parts and service manager. He will have supervision over the combination and expansion of regional and zone warehouse facilities which will be set up along the same general lines as those established recently in the Southeastern States in the territory controlled by the South East Sales Co. Parts and accessories for the three units will be handled as formerly, dealers ordering directly from their zone warehouses. It is obvious, of course, that the amalgamation of the sales activities of the three units will result in better parts distribution facilities since it will be possible to maintain more parts depots than was the case for each unit separately.

A further beneficial result of the combined handling of service parts and accessories should be the eventual elimination of separate parts numbers and possible differences in prices on such car parts as are interchangeable on two or more lines. Mr. Grant is authority for the statement that the new company will endeavor as rapidly as possible to give the dealer the benefits of simplification possible in this direction. This will take time, however.

The set-up also makes possible the transference of service helps to dealers from factories to field offices where they are more readily available to the dealer. The work will be supervised by the home office of the new company but each unit will have technical service men at the home office rather than individual service managers, to provide all individual factory assistance possible without conflicting with the more direct functioning of the specialized field staffs.

The South East and North West Sales companies will be merged into the new company. In their respective territories, distribution of the Cadillac line will be handled by the new company and in Montana where the North West Sales Co. has been functioning since the first of the year, the new company will also handle Chevrolet and General Motors trucks. Distribution of Chevrolet, Cadillac and General Motors trucks will not be affected at other points.

No changes have been made in policies relating to resale of parts to independent shops.

Bridgeman Formula Corrected

IN our issue of February 6, last, we printed a formula given by Dr. O. C. Bridgeman, of the Bureau of Standards, in the discussion of Alex Taub's paper on "Engine Bearings from the Designer's Viewpoint." Two different versions of the formula were given, but that given on page 180 is correct:

$$H = PV \times \left[a + b\frac{D}{c}\left(\frac{ZN}{P}\right)\right] LD$$

In the foregoing H is the rate at which energy is being consumed in overcoming friction in the bearing, in foot-pounds per minute, while the factors of the right-hand side of the equation have the following meanings:

P, pressure on projected area, in pounds per square inch.

V, surface speed of journal in feet per minute.

D, diameter of journal, in inches.

c, diametral clearance (difference between the diameters of the bearing and journal), in inches.

Z, absolute viscosity of lubricant at temperature of bearing, in centipoises.

N, speed of journal, in revolutions per minute.

L, length of bearing, in inches.

The foregoing equation is based directly on one given in an A.S.M.E. paper by S. A. and T. R. McKee, on "The Friction of Journal Bearings as Influenced by Clearance and Length." The value of a in the equation is dependent upon the length/diameter ratio of the bearing and, for bearings of the proportions commonly used in automobile engines, is equal to approximately 0.002, while the constant b has the value 473×10^{-10}. The term in brackets in the equation evidently represents the coefficient of friction.

Photo by Cameranews *for Automotive Industries*

Willys is Back; Ready to Survey Toledo Crisis

"I am still ambassador to Poland," he says, but admits that future course depends on what he sees in Ohio city

The New York staff representative of Automotive Industries was the first member of the press to greet Mr. Willys on his return from Europe. The above photo, taken on shipboard, shows Mr. Willys with Sir William Letts (left), head of Willys-Overland Crossley, Ltd., who accompanied him, and Ward M. Canaday, president of the United States Advertising Corp., talking to our representative

by A. Burdet Crofoot

"I AM still ambassador to Poland and I expect to return to my post in a few weeks," His Excellency, John North Willys told *Automotive Industries* on his arrival in New York this week. Just how long he will stay in this country, or what action he will take while here, Mr. Willys could not tell until he had an opportunity to look over the ground for himself. The trip, however, was admittedly a hurried and unexpected one. He left Paris, where he had gone for a few days, at about the time he was expecting to return to Warsaw.

After a conference in New York with L. A. Miller, president of the Willys-Overland Co., Mr. Willys planned to go on to Toledo to look over the situation there. Asked whether preferred stockholders planned to take over control of the company, which they are entitled by charter to do after July 1, he repeated that he hoped to return to Warsaw in a few weeks' time. He heads the syndicate which controls the company's preferred stock.

He further reiterated a statement made several months ago when he was in this country, that he would prefer to keep out of the active management of the company, feeling that he had done his share in its upbuilding and that he was now entitled to rest from such active business affairs.

There is no friction between his interests and those of the financial or management group now in voting control of the company, Mr. Willys indicated. The purpose of this visit is merely for Mr. Willys to gain first-hand information as to just what the situation is today and for him to decide then what steps may be necessary to effect an improvement.

Sir William Letts, head of Willys-Overland Crossley, Ltd., British affiliate of the American company, accompanied Mr. Willys on this trip. Asked as to his plans, he said that his interests were identical with those of Mr. Willys, and that he too is coming over here merely to see just what the situation is. He plans to make the return trip at the same time Mr. Willys does.

For the Business Bookshelf

The Gasoline Automobile

The Gasoline Automobile, by Ben G. Elliott, M. E., and Earl E. Consoliver, M. E., Fourth Edition. Published by McGraw-Hill Book Co., Inc., New York.

Gasoline Automobiles, by James A. Moyer. Fourth Edition. Published by McGraw-Hill Book Co., Inc., New York.

THESE two books, as indicated by their titles, cover exactly the same field, and the manner of treatment is much the same in both. Mr. Moyer's book, according to his preface, is intended to furnish practical help to owners and drivers of cars, while the volume of Professors Elliott and Consoliver seems to be intended more particularly for instruction purposes, having been prepared in the extension division of the University of Wisconsin. Both volumes have passed through a number of editions and therefore have proved their usefulness. It may be said that as regards general arrangement of the material they are a considerable improvement over a book that dominated this field up to some years ago. The authors of both volumes seem to have been at pains to include some information on all of the latest developments in the automobile field, and we find brief discussions of such items as vacuum booster brakes, Diesel engines, synchronizing clutches for transmissions, free-wheeling units and automatic clutches.

One criticism that applies to both books is that the language used is often lacking in clarity and precision. Thus in "The Gasoline Automobile" it is stated (p. 137) that "a mixture which is economical for running will show a tendency to backfire on acceleration." If the engine shows a tendency to backfire when the throttle is opened for acceleration, it is rather conclusive evidence that it is not receiving the same mixture as previously, and what the authors probably meant is that a carburetor setting which gives an economical mixture under conditions of constant engine speed will tend to cause backfiring when the engine is being accelerated.

On the same page there occurs the statement: "It is sometimes true that an engine will appear to run better at night than during the daytime," from which it might be concluded that it is sometimes not true that an engine will appear to run better at night, and the reader will wonder when it is true and when it is not true that an engine will appear, etc.

It is difficult to agree with Mr. Moyer's definition of free wheeling (p. 381) as "the automatic release of the drive (usually the rear) wheels of an automobile from the engine when the drive or propeller shaft is operating at a relatively slower speed than the wheels of the automobile." Except in the very rare cars that have a variable gear between the wheels and the propeller shaft, the relation of propeller-shaft speed to the (mean) speed of the drive wheels is fixed by positive gearing, and it cannot be relatively slower and relatively faster than the wheels of the car.

Mr. Moyer's definition of the ampere as "the quantity of electricity passing over a wire" is also incorrect. Quantity of electricity is measured in coulombs or in ampere-hours, and the ampere is a unit for the measurement of rate of flow, not of quantity. The intimation in the following sentence that ampere-hours means amperes per hour and is equivalent to gallons per hour in the hydraulic analogy also is far from the truth.

Diesel Engines

Dieselmaschinen V, published by VDI Verlag, Berlin NW-7, Germany.

DURING the period of the past seven or eight years the Verein Deutscher Ingenieure (German Society of Engineers) has published at irregular intervals special issues of its periodical which are devoted exclusively to Diesel engines. The present one is the fifth of this series, and it contains contributions from about a score of writers, the subjects covering practically the whole range of Diesel engine problems. As is usual with VDI publications, Dieselmaschinen V is well illustrated, containing no less than 440 text illustrations and a number of folding plates. The contents include articles on Diesel engine subjects which have appeared in the "Zeitschrift" in recent times and in addition a number of papers not previously published, particularly papers presented at the seventieth general meeting of the society in Cologne last year.

While the contributions to these special issues on Diesel engines cover the whole field of Diesel engine activity, it is worth noting that more and more space is being devoted to high-speed Diesel engines, and one has the impression that in the current issue this phase of the general subject predominates. Oil Engine Research Work in the United States is covered in a paper by Wm. F. Joachim, and there is a similar paper on development of English high-speed oil engines by S. J. Davies.

Aircraft Engines

Flugmotoren in Leicht- u. Schweroelbauart (Aircraft Engines for Light and Heavy Fuels), by Dipl.-Ing. W. Thoelz, edited by Dr. W. Haeder. Published by Richard Carl Schmidt & Co., Berlin.

THIS is a book for the designer, in which the principles, the design practices and particularly the necessary calculations are presented in condensed form. The book, as the title indicates, covers both carburetor-type and Diesel aircraft engines. Haeder has a particular style of presentation which seems to have met with considerable favor among German engineers and designers, since a whole series of engineering handbooks have been written or edited by him. Formulas are given for practically all dimensions of all of the principal parts of both types of engine, without their deduction, and the book is well illustrated, containing 237 text illustrations and 10 plates. While the calculations exemplified in the book naturally cannot be applied directly to every kind of aircraft engine, it has been the author's aim to present them in such manner that they can be readily adapted to unusual designs.

JUST AMONG OURSELVES

John Willys in Harness

JOHN WILLYS is home again. Sir William Letts is with him. At the present writing he is officially on a leave of absence from his post as Ambassador to Poland.

His homecoming would be automotive news at any time because of his past prominence in our industry. It is an event of front-page interest at this time because it may portend his even greater future prominence.

As everybody knows, if Willys-Overland doesn't pay a preferred stock dividend on July 1, 1932, exclusive voting rights will become vested in the preferred stock. And John Willys and his associates are said to control the preferred stock.

Knowing nothing except what appears on the surface and without any inside information whatever, we predict that Willys will be back actively in the automotive industry within a few months. His whole history, his whole personal makeup indicate that just such a situation as that which exists at present sounds a call more likely to be heard by him than any other imaginable. Trouble has been the foundation of Willys' successes time and time again. Trouble challenges his fighting spirit. Trouble brings to flower the best fruit of his particular genius.

If business were good and the economic sun were shining, John Willys might have retired quietly some time from his position of diplomatic honor and spent the rest of his life reminiscing with his innumerable friends about the business battles of yesteryear. But business isn't good. The economic woods are on fire. The call goes out for the best of the fire fighters!

Yes, our guess is that John Willys will come back—again!

Blees is That Kind

AS the confusion of General Motors reorganization toward centralization clears away, one quiet-spoken, clear-eyed, firm-thinking young executive has emerged second in sales authority in the corporation only to the dominating figure of R. H. Grant himself. Known but casually throughout the industry at large prior to the last few years, the calm, effective personality of W. A. Blees seems destined to be one of the potent figures in automotive merchandising of the future.

One day several years ago, J. D. Mooney had invited us for a spin in the maiden voyage of his new 40 m.p.h. speedboat, just being delivered to a dock in the Hudson River. As we were about to leave Mr. Mooney's office a small man, clad in a light raincoat and wearing a slouchy felt hat, entered. "Come along with us," Mr. Mooney invited. He did. That was our first meeting with the man who had just been made vice-president in charge of sales at Oakland and who now is general sales manager of the newly formed Buick-Oldsmobile-Pontiac sales company.

We imposed on that acquaintance shortly after to call on Mr. Blees in Pontiac, to try to get some material about him to put into print. We found him extremely cordial, almost unbelievably familiar with every practical element in the automotive sales picture, quite frank in his expressions—and, to our sorrow, utterly opposed to publicity for himself. And he meant it!

And he hadn't changed a bit when we talked with him the other day in his new office in Detroit. If he reads this little article, he'll almost certainly be displeased. But we had to print it. He's a public figure in our industry today and people want to know more about him.

We can tell more about him in a few words by reprinting part of an item printed a short while ago by the *Kansas City Journal-Post* than in any other way we know. Here's the drama there recorded:

"Four minutes to play—and with the score deadlocked, 3 to 3. Missouri and Kansas facing each other in the annual football game. Thousands of rooters pleading with the Tigers to 'hold that line!' Thousands of Kansans yelling vociferously for a touchdown.

"A signal called, a flash of pigskin, and Ammons, Kansas fullback, 6 ft. 200 lb. of bone and muscle, has the ball and breaks through the Missouri line. A groan goes up from the Tiger supporters. There isn't a chance to stop that lumbering Jayhawk in his dash for the goal.

"But wait! Little Billy Blees is on the job. Quarterback for Missouri. Small, wiry, weighing 122 lb. Lots of sand, nerve.

"Blees against Ammons. The quarterback will be killed.

"Ball tucked under his arm, Ammons is plowing along like an army tank. He has bowled over all opposition. And then Little Billy Blees leaves the ground in a flying tackle! His arms encircle the legs of the behemoth. Cling there. And Big Ammons strikes the ground with a resounding crash.

"Then the whistle blows. The game is saved!"

He's still that kind of man.
—N.G.S.

SAVINGS amounting to 50 per cent or more in fuel cost is the alluring promise offered by the Diesel engine for automotive applications. There are other advantages, to be sure, which have placed the Diesel in a favorable position for aircraft, marine and general industrial uses.

But what are its immediate prospects in the bus and truck field—the sphere of greatest production-volume possibilities?

If there is one characteristic of motorized transport uppermost in the mind of maker and buyer alike—it is performance. You can generally define this in terms of acceleration, flexibility, power and smoothness, without going to further detail. American buyers at least, will not sacrifice performance on any account. Any comparison between the Diesel and gasoline engines must take this into consideration.

How many people delving into this Diesel question have shared the writer's feeling of confusion in going over the published records. Opinions of experts differ; test results are often contradictory. Isn't this due to the fact that we are concerned with a really infant industry? For the Diesel engine is but an infant when it comes to high-speed automotive work. For any real comparison we must think of the Diesel in terms of its highest ultimate development—almost ideal conditions, before a fair comparison of performance may be made between the Diesel-in-the-making and the gasoline engine with some 25 years' growth.

The Diesel was originally intended and designed for stationary use. Most of the early applications were in power houses and motor ships. Consequently, flexibility was never a factor—but torque characteristics, economy, long life and reliability were. It is therefore the opinion of many well-informed engineers that the automotive Diesel will demand a good deal of new research and considerable outlay for development if it is to compete on an equal basis with the gasoline engine's flexibility.

Some of the changes are under way as this article is being written. Combustion problems are the most difficult confronting the designer. Cylinder-head design, injection systems and ignition characteristics are being closely scrutinized. So much so, in fact, that in England the oil-burning engines sometimes are called "C.I." (compression-ignition) engines (1) instead of Diesel.

Judging from recent technical papers, only certain makes of Diesel engines now in production can meet the requirements of present-day buses and heavy-duty trucks. We are thinking now of the performance factor which is regarded so jealously by the public. At the last Transportation Meeting, Col. G. A. Green (2) described the results of a comprehensive test of a British Diesel engine in a G.M. bus chassis in direct comparison with an "equivalent" gasoline engine. Briefly, the Diesel failed to give fully comparable performance, particularly on acceleration tests. It did not produce the promised fuel economy because under conditions favorable to high power it smoked badly and when readjusted for a clear exhaust which favors economy, power suffered.

On the other hand, A. A. Lyman of the Public Service Coordinated Transport reports (3) some highly successful results with another make of Diesel installed on a gas-electric bus. This engine had virtually a colorless exhaust, and specific fuel economy was about 60 per cent better than with the usual gasoline engine. Moreover, Mr. Lyman found the road performance to be quite comparable with that of a gasoline-driven vehicle.

These diametrically opposed conclusions simply prove the point that not all Diesels in production today are suitable for transport units. Great discrimination must be exercised in their selection for any particular use. No doubt, the impetus of the present drive will result in a greater variety of makes suitable for the exacting requirements of road transport.

And in the final analysis all comparisons will have to be made on the basis of the best product of the Diesel engineer's art (now in the making) weighed against the gasoline engine with its background of over twenty-five years of constant improvement.

With this perspective, let us analyze the economic place of the Diesel in the automotive industry. This field may be set down thus:

1. Aircraft. Here the Packard Diesel has unques-

(1) The Modern Diesel, 1st Edition (1932), pub. Iliffe & Sons, Ltd. (England).

(2) Commercial Application of Diesel Engines in Heavy-Duty Motorcoaches and Trucks. S.A.E. Jour., Feb., 1932.

(3) Diesel-Engine Motorcoach Operation and Maintenance. S.A.E. Jour., March, 1931.

This is the second of a series of articles on the Future of the Diesel Engine. Subsequent articles will appear shortly in Automotive Industries

tionably demonstrated its practicability. Its chief advantages are economy, freedom from fire hazard, reliability due to the absence of high-tension ignition, carburetor frosting and good radio operation—so important in air transport.

2. Marine. The same advantages apply. Moreover, the engines now in production fill performance requirements to the letter.

3. Stationary. Chief advantages for the wide range of industrial applications are: Fuel economy, favorable torque characteristics, reliability and better cooling. The current designs of Diesel engines handle these units admirably.

4. Truck and bus (heavy-duty units only). The chief advantages are: Fuel economy and favorable torque curve. The suitability of present engines must be gaged by performance tests. It is in this high-production field that the most significant changes in design must come.

The following reports from the files of the Department of Commerce, abstracted through the courtesy of A. W. Childs, reflect the situation abroad:

"1. Report dated November 11, 1931, from our London Office reporting on the commercial motor vehicle exhibition: 'According to the official catalog issued by the Society of Motor Manufacturers and Traders, a total of 399 chassis were displayed. Of this number 357 were gasoline vehicles, 28 heavy oil, 8 steam and 6 electric. Of the heavy oil vehicles on display 22 were 6-cylinder, 5 were 4-cylinder and one a 5-cylinder model. Among the outstanding features of this year's exhibition is the variety of British-built oil engines shown in commercial vehicle chassis. At the last show held in 1929 there were only three makes of oil engines displayed, all of which were of foreign origin,

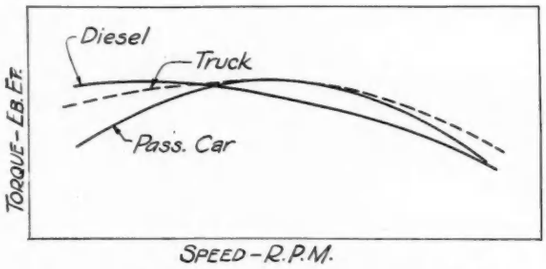
The high-speed Diesel engine is as finicking as a child about its food. Feeding it crude oil for fuel produces "indigestion"

whereas no less than 12 British makes were on exhibition at the recent show. The advance in this field, however, is not completely brought out by this comparison, for some proprietary engines, such as the Gardner, are being used in Pagefield, Foden, T. S., Carrier and one or two additional chassis. In some models customers have the choice of either oil or gasoline engines. Oil engines form the chief features of several exhibits. It has recently been authoritatively stated that there are now more than 600 oil-engine vehicles operating in the British Isles.' "

Automotive Diesels Should be Designed and Evaluated for Specific Problems

by
Joseph
Geschelin

Opinions of experts, based on tests, show diametrically opposite conclusions on the performance of "equivalent" oil and gasoline engines. Future comparisons will have to be made using the best product of the Diesel engineer's art against the best in the gasoline field, carefully evaluating the function for which each was designed



Shape of the Diesel engine torque curve may be varied by suitable designing to take care of specific conditions of loading

"2. The report dated November 25, 1931, from our Calcutta Office, subject Diesel Engined Buses: 'The Eastern Automobile Works in Calcutta took the agency for the Laffly Diesel Engine truck manufactured in France. When the first truck arrived it was found to be too high in price for the market and these people are now importing fuel oil engines manufactured by another firm in Paris and are installing them in bus chassis. These motors are 10-hp. rating. It is claimed that a bus so equipped will make 35 miles to one gallon of fuel oil although the total bus load is somewhat reduced owing to the small horsepower of the motor. Several of the above type motors have been installed in light second-hand American bus chassis and orders for four more have been taken.' "

Another interesting report by W. F. Bradley (our Paris correspondent) was published in *Automotive Industries* (4) recently.

If, as suggested earlier, we look at the Diesel in the light of its potential technical development, what are the ideal objectives which might guide the designer? Easily the first of these is performance, comprising acceleration, flexibility and freedom from objectionable exhaust. Next in order of importance is weight per b.hp. This must, and in the opinion of many engineers can, be brought down close to weight of a gasoline engine.

We speak of high speed. What is high speed in automotive circles today? According to the 1932 Statistical Issue of *Automotive Industries*, maximum horsepower of passenger car engines is at about 3000 r.p.m., and the tendency seems to be in the vicinity of 4000 r.p.m. From the same source we find that stock engines (truck and industrial models) are capable of 3600 r.p.m. in some cases, while 44 models range from 2500 to 3200 r.p.m.

To match this, a check of European Diesels shows two makes running at 2000; one at 2500; one at 2200, and eight at 1800 r.p.m.

Concerning this aspect of the problem, C. B. Dicksee says in a recent paper read in England: "It is frequently stated that high speeds are impossible with a compression-ignition engine because the rate of combustion imposes a definite limit. This is undoubtedly true in many cases but is not fundamentally correct, and provided that suitable means are adopted for insuring that the fuel and air are brought into contact with each other at a rate which is proportional to the engine speed, the combustion can, and will, keep pace with the speed of the engine, as will be shown later."

Perhaps the most resultful direction of Diesel development is toward the two-stroke cycle. According to W. F. Joachim and other workers in this field, the two-stroke cycle should achieve a marked reduction in weight "even below that of a gasoline engine," and will be much smoother in action. Although the fuel economy is slightly lower due to losses in thermal and mechanical efficiency, the net result is said to be an admirable compromise.

If and when the weight is brought down to gasoline engine practice and Diesels are produced in appreciable quantities, there seems to be no reason why they should cost more per pound or per b.hp. than the gasoline engine. That's another objective, and many people, including Professor Lucke of Columbia University, think it can be done.

Perhaps one of the best expositions of the manifold problems confronting the Diesel engine designer is found in the paper read by C. B. Dicksee (5) at a joint meeting of engineering societies in England last month. His comments and substantiating research work should prove of interest to everyone concerned with this work.

Torque characteristics of the Diesel engine have come in for a lot of discussion. That the torque curve may be given almost any desired form has been demonstrated by Dr.-Ing. W. Riehm in a recent study. His work indicates that the character of the torque curve is really a function of fuel pump design and varies with its behavior. A comparison of the general forms of the torque curves for passenger car, truck and Diesel engines is given in Fig. 1. As shown, the Diesel curve may be given an increasing slope backward so that the engine offers a stiffer turning moment as the speed is decreased. This means that it is more difficult to stall the engine by a temporary overload.

Needless to say, this is glad tidings for an operator of heavy-duty units. However, a check-up of the 1932 crop of gasoline engines designed for heavy duty shows that their torque curves are quite comparable with the Diesel, so that in this respect there may not be an overwhelming advantage in favor of either type.

The problem of smoky exhaust is a serious one. Colonel Green found it decidedly objectionable during the course of his tests. However, W. F. Joachim and many others believe that this can be corrected by careful design. Dicksee concurs with this in his recent paper and concludes that "the presence of thick smoke when only a moderate percentage of air has been consumed indicates that the method of searching out the oxygen is inadequate, that some parts of the combustion chamber are receiving an excess, while others are receiving a deficiency of fuel, and that an increase in turbulence or a change in nozzle design is called for." Again he says, "About 85 per cent of the oxygen appears to be the maximum which can be utilized and a clear exhaust be retained. By allowing a certain amount of color in the exhaust it is nearly always possible to obtain an increase in m.e.p. without too great a sacrifice of economy. For road work, however, a colorless exhaust is essential."

If the Diesel is to compare favorably with a gasoline engine on the basis of weight per b.hp., it is necessary to expend considerable effort in the direction of increasing the mean effective pressure (m.e.p.). According to Dicksee, "the problem of developing a high m.e.p. is thus seen to turn upon the question of maintaining the rate of combustion and at the same time utilizing the maximum amount of air."

That the problem of smooth running may be satis-

(4) More Diesel-Engined Chassis Appear at Paris Commercial Vehicle Show by W. F. Bradley, *Automotive Industries*, Dec. 19, 1931.

(5) Some Problems Connected with High-Speed Compression-Ignition Engine Development, by C. D. Dicksee. Paper read at joint meeting of English engineering societies on March 1, 1932.

factorily solved is indicated by Dicksee in the following remarks: "An engine which will operate with perfect smoothness under a high load factor may show distinct signs of roughness when running under light loads. This experience appears to be fairly general, and is particularly noticeable under starting conditions and also when running light.

"The tendency toward roughness at light loads will be increased if it is not possible to arrange for some part of the combustion chamber to reach a high temperature. It is, of course, possible to arrange for a hot-spot to exist in almost any design of combustion chamber. The difficulty in some designs is to prevent it from exerting an adverse influence upon the volumetric efficiency. To this end the hot-spot must be situated in such a position that the incoming air will not come into contact with it during the suction stroke."

In considering performance, ease of starting is an essential factor if we are to consider the Diesel as a widespread development. Dicksee suggests, "The question of starting from cold is very greatly modified if some external source of heat is used to insure ignition during the first few cycles, and the question of starting may thereby be relegated to a position of secondary importance as compared with other considerations. The means of supplying this additional heat usually takes the form of electrically heated 'glow plugs' or some form of cartridge. In some designs the provision of means for temporarily increasing the compression-ratio has been successfully employed, a ratio of about 20:1 being used for this purpose."

The foregoing touches briefly on some of the features of the automotive Diesel which seem to require further development. In the opinion of many people concerned with the problem, this additional research is a vital necessity if the Diesel is to make a good showing in comparison with the gasoline engine which represents at least 25 years of constant improvement.

In the battle for lower weight, the designer will undoubtedly call upon the strong, light alloys which are now so abundant. Perhaps the most useful of these might be the strong alloys of aluminum, magnesium and possibly beryllium. With the present practice of using centrifugally cast cylinder liners, it is perfectly feasible to have both crankcase and cylinder block of light alloys.

No doubt additional impetus will be given to Diesel development by the competition of devices designed to burn fuel oil in the orthodox gasoline engine. The following Department of Commerce report comments on a development in Europe. "Report from the American Consul General in Stockholm, Sweden, entitled 'The Hesselman Engine': 'According to newspaper articles K. J. E. Hesselman, a Swedish engineer, has succeeded after careful study accompanied by experiments during several years in solving the problem of producing an engine running on heavy oil for motor cars and similar purposes. Mr. Hesselman has succeeded in developing what many have considered an ideal almost impossible to attain by combining the advantages of a Diesel engine and a gasoline engine without the disadvantages inherent to these different types.' "

In this country, Dr. M. J. Zucrow reports remarkable results in burning a low-grade fuel oil in gasoline engines in heavy-duty bus operation. This is accomplished by means of the Paragon Vaporizer which was described in *Automotive Industries* recently (°).

The development of the high-speed automotive Diesel, however, is coming along rapidly. We understand from reliable sources that a number of prominent manufacturers are working on new injection systems which may be announced this year. The picture is shifting so rapidly that the theory of today may be the reality of tomorrow.

(°) Paragon Vaporizer Designed for Heavy-Duty Engine *Automotive Industries*, Nov. 28, 1931.

Quality of Safety Glass Varies With Central Layer

AS is well known, safety glass consists of two layers of ordinary glass or plate glass cemented to opposite sides of a central layer of some transparent organic material. This organic material must adhere well to the glass and it must also be exceptionally stable in its physical properties under atmospheric influences. When such safety glass is broken, no shatters are formed, the pieces adhering to the central layer. The following comments on the properties of and processes for manufacturing safety glass are taken from an article by Th. Pesch in *Chemiker Zeitung* for September, 1931:

Compared with an ordinary glass, such a glass must be comparatively flexible, in order to diminish the chances of breakage; it must also be very stable; that is to say, it must retain its qualities of clearness, transparence, absence of blurs, good adherence between the different layers, etc., throughout a wide temperature range. Its non-shattering quality has led to many applications, such as to windows of automobiles and airplanes, goggles for workmen, chauffeurs and motorcyclists, gas masks, windows for bullet-proof vehicles, etc.

The outer layers are either of ordinary or plate glass, while the central layer consists of celluloid, acetylcellulose, or some artificial resin. The use of resins greatly simplifies the manufacturing process. Safety glass with a central layer of resin is superior with respect to clearness, but it can be used only within a narrow temperature range. It cannot be used in the tropics, nor can it be exposed to severe winter temperatures in the temperate zones.

Safety glass with a celluloid central layer is very resistant to cold, but it is sensitive to heat and to sunlight, which give it a brownish tint. An addition of urea slows down this discoloration process, which may also be prevented by slightly bluing the celluloid.

Cellulose acetate, plasticised by the addition of certain products, is resistant to light, but it is difficult to find a plasticiser which will give a mixture that is quite transparent, which adheres well, and which resists the highest as well as the lowest temperatures. The plate has a tendency to shrink at the edges. A similar effect is obtained when the plasticiser volatilizes, or if water gets in between the layers. To obviate trouble from these causes, the plasticiser must have the lowest possible volatility. One way of preventing trouble due to volatilization consists in removing the acetylcellulose near the edge.

It is stated by the author that to resist bullets from a Browning gun the safety glass must be from 0.63 to 0.71 in. thick; to resist bullets from a 7.65 mm. caliber gun it must be 1¼ in. thick, and to resist bullets from a military rifle it must be from 3 to 4 in. thick.

Firing Foremen In Factories Is

by Joseph Geschelin

HOW often do you suppose that you heave out of the window stuff worth $5,000 net? Hardly rates a come-back, does it? Yet four out of five (maybe the percentage is a little low) do!

What we are thinking about are the sizable chunks plucked out of the dividend pie by the "intangible" dollars represented in the turnover of factory executives about the level of foremen. That term "intangible" is costing a lot of money. Anything we can't pin down definitely goes into that class—and we don't give it another thought. When the factory manager comes around and says it's wrong to let a certain foreman go because the company loses money thereby, how far does he get?

Evidently something must be done to work out a formula or at least an approach to one so that we may estimate how much Smith, Jones, and Babbitt take with them when they go out. You're right—it has been tried before. But can our academic friends help us much? Not if we are to judge by current literature. So with considerable trepidation we intend to try our hand at it.

Like a ray of sunshine, some recent sessions of the engineering societies brought the very ideas we were seeking. At the annual meeting of the A. S. M. E. last December, R. E. W. Harrison of Cincinnati Grinders broadcast the fact that a foreman is worth between $10,000 and $15,000 to his company, according to a recent study. Just six weeks later at the S. A. E. annual meeting last January, Gordon Lefebvre, well-known factory executive, said that a foreman is worth at least $5,000 on the hoof. So here we have definite figures at last.

"How do you get these estimates?" we inquired, scenting a story. We asked a number of other people the same question and slowly saw the veil of mystery drawn from the "intangibles."

Let us say at the outset that an answer to the cost of labor turnover was impossible before the development of the truly remarkable budget control systems now operating in so many automotive plants. Having had the happy experience of watching these systems at work, we can see their place in the development of the present idea. Most people realize that overhead budget control is doing a good job of cutting operating costs. Looking at it critically, we find that its greatest value lies in throwing a light on expense accounts. Nothing is tucked away under the mystic heading of "miscellaneous." Moreover, the budget sets the par for accomplishment; gives the foremen and other executives a mark to shoot at.

But it is just too bad that the achievements of these budgets have led to a belief in many quarters that the system functions like an adding machine or a typewriter. Let no one tell you that it works by levers or valves or formulas. The real mechanism behind it all is the *man*. It takes brains of a certain kind and lots of training to keep the factory department going full blast and yet have all expense items under control; it takes even more to do the same when schedules are shot.

So our formula is not complete even when we consider all measurable quantities. However the figures that can be estimated tell enough of a story.

For a quick picture of this thing, consider information shown in Figs. 1 and 2. Here is the course of events in one department of an actual plant whose product has net sales of about $1,500,000 a year. The summarized budget statement contains the following controllable accounts with the key notation at the side:

Table I

1.	Direct labor	(dl)
2.	Indirect labor	(il)
3.	Supervision	(su)
4.	Maintenance	(m)
5.	Scrap	(s)
6.	Productive supplies	(ps)
7.	Maintenance supplies	(ms)
8.	Total of above	gt)
9.	Total minus dl	(t)
10.	Net sales	(ns)

An Expensive Pastime

Some recent estimates have placed his value to the plant between $10,000 and $15,000; when he goes out the door a number of controllable expense items begin to bulge upward.

Striking, isn't it, how the ratio of every account to net sales dips downward to better efficiency? Incidentally, Fig. 1 shows the general level of controllable expense items. The accounts in Fig. 2 naturally are higher in the scale, but they, too, are controllable by judicious administration, constant improvement in methods, utilization of modern machinery, and so on.

Getting into it closer, we examine each account separately. Direct labor has dropped 42 per cent with respect to net sales as compared with the ratio in 1929 when this budget began to operate. Scrap shows a decrease of 80 per cent compared with previous records. But the net effect of all this is seen best in comparing the history of the total, *t*, with respect to net sales; the improvement is almost 52 per cent.

Now the man who gave us these figures estimates that it would take a new foreman in a department, such as this one, two or three years to learn the nature of expense accounts and their interrelation. Only then could he watch them properly and thereby maintain the record of constant improvement of the old foreman. We may therefore assume that a change in the management of this department might be immediately reflected in a rise of ratios despite the honest efforts of the new man. This rise may approach the early experience of the department, say, back in 1929.

The TOTAL rise in the cost of expense accounts is a part of the investment you will make in the education of the new foreman. The percentage rise multiplied by the net sales in dollars and cents gives the money value of the investment. Where does this money come from? Obviously from the profit, because the overhead burden in this department has to go up, thus cutting into the margin between prime cost and the selling price. And you can't do much to the selling price because the tendency always is to decrease it.

Nor is this an unusual example. Many well-managed plants, guided by a good budget control, are showing a comparable record. In fact, what would be the justification for the budget if it did not show such tangible saving? Moreover, the trend of the expense accounts for different departments in any given factory will be about the same.

Don't suppose, however, that the measurable saving indicated here is the only one that your foreman achieves. Several times a day or several times an hour, the foreman is called upon to make a quick

(Turn to page 629, please)

Fig. 1

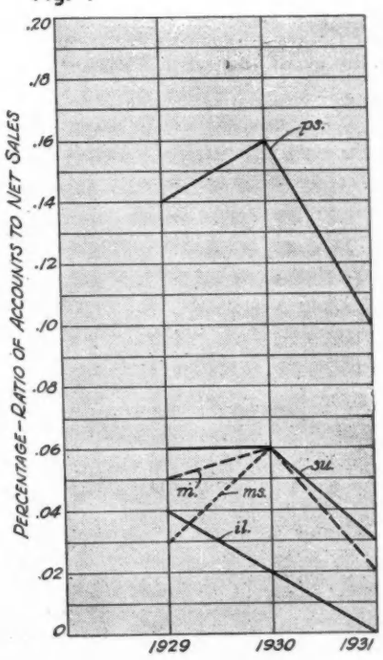
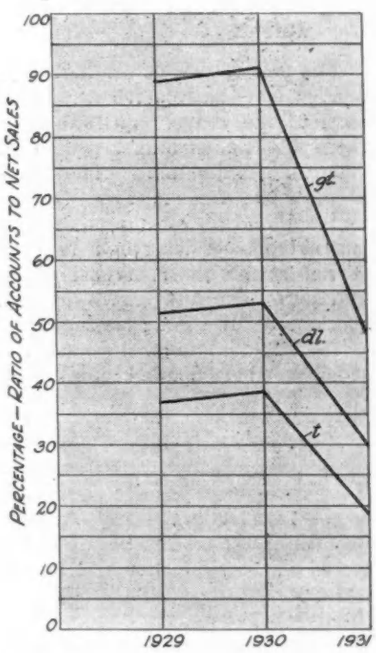


Fig. 2



Course of expense accounts under the influence of an overhead budget. This is the picture in one department of a plant having net yearly sales of about $1,500,000. For key to abbreviations see Table I of text. Percentage is the ratio of the expense account to net sales

Elasticity of Phenolic Laminated Gears

The lightness of gears of this type brings the moment of inertia of the camshaft system to a minimum, and the high elasticity allows deflection with minimum stress, with the corollary that the laminated member should be on the camshaft

IN selecting the type of timing drive to use on a modern automobile engine, there are five requirements to be fulfilled:

1. It must maintain accurate timing throughout its life.
2. It should be quiet enough to be difficult to detect among the other engine noises.
3. It should be durable enough to last as long as the other principal moving parts of the engine.
4. It should be economical to produce and install.
5. It should not contribute materially to the engine weight.

The use of one or another type of timing drive depends upon the relative value which engineers place on each of the above requirements and the fulfillment of them by the various types of drive in their present state of development. The purpose of this article is to show the present state of development in the design and application of non-metallic gears of the phenolic laminated type, describe a few tests which may be used to determine their structural and wearing qualities, and point out how gears as used today fulfill the requirements of a good timing drive.

The material under discussion consists fundamentally of cotton fibers bonded together by a phenolic resin and

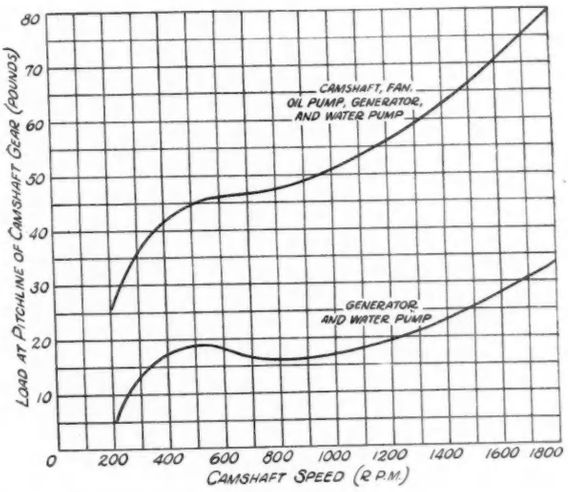


Fig. 3—Loads on teeth of camshaft gear on a six-cylinder 300 cu. in. overhead-valve engine

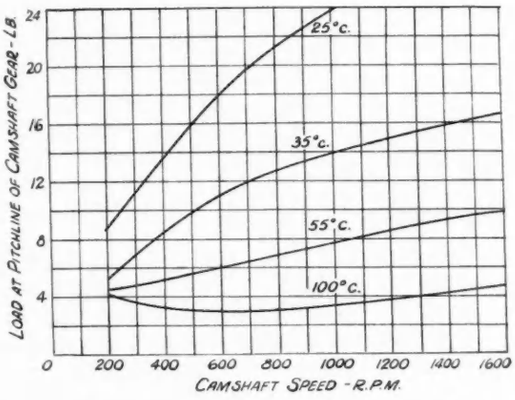


Fig. 1—Load at pitchline of camshaft gear on a 200 cu. in. four-cylinder L-head engine, including load due to oil pump—effect of temperature

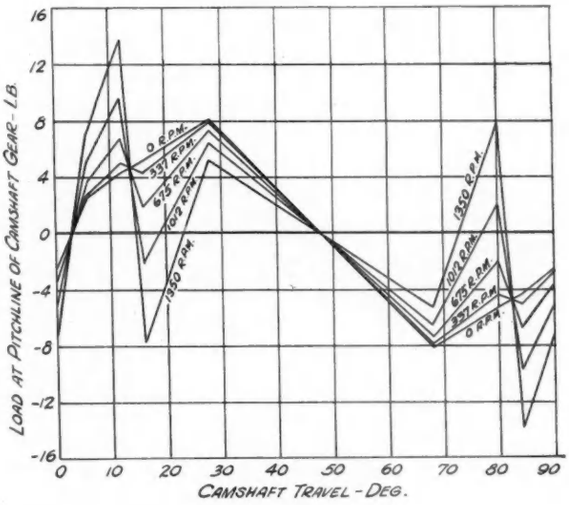


Fig. 2—Calculated pulsations of camshaft load caused by spring and inertia forces in the valve system of a 200 cu. in. four-cylinder L-head engine

Offers Advantages in Timing-Train

by
C. W. Mansur*
and
H. M. Richardson*

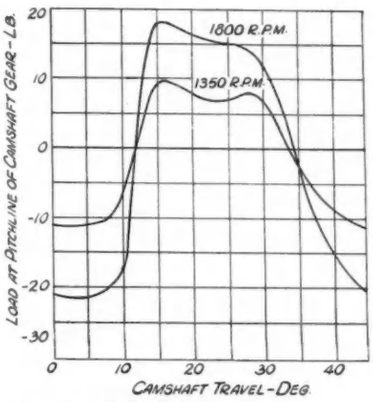


Fig. 5—Calculated pulsation of camshaft load caused by spring and inertia forces in an eight-cylinder engine with the same valve-assembly forces as in Fig. 4

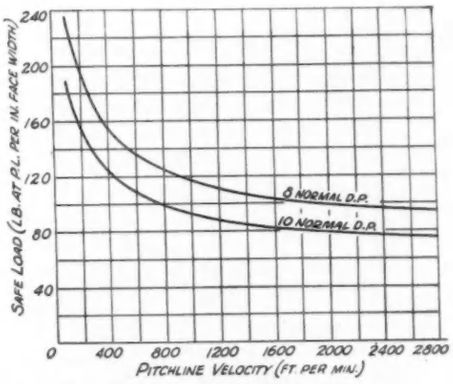


Fig. 6—Safe working loads of Textolite timing gears of 8 and 10 normal pitch, 14½-deg. normal pressure angle and 50 to 60 teeth, in lb. p. in. of face width. Add 17 per cent for 20-deg. pressure angle

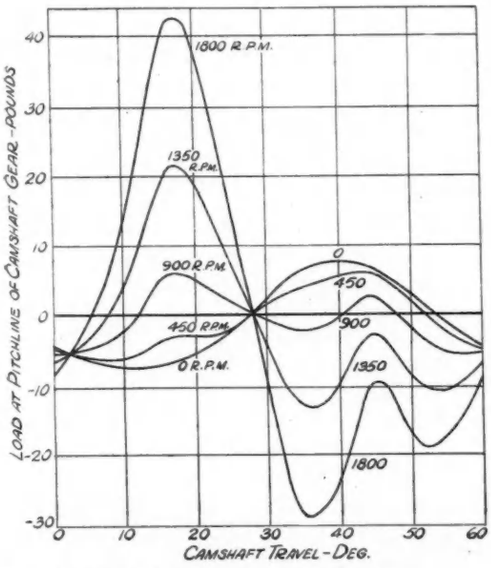


Fig. 4—Calculated pulsations of camshaft load caused by spring and inertia forces in the valve system of a 300 cu. in. six-cylinder overhead-valve engine

molded under heat and high pressure into a gear blank of the desired shape, which can be machined in much the same way as cast iron. Representative types of this material are known by their trade names as Celoron, Formica, Micarta and Textolite, all of which are fundamentally the same, but differ slightly in properties and in method of construction. Specifically we shall speak of the properties, application and tests of Textolite, with which we are most familiar.

*General Electric Co.

In the case of Textolite timing gears, the construction consists of a laminated rim, a molded web, and usually a steel hub. The rim is made of heavy cotton fabric coated with the uncured resin and built up into a laminated ring. The web consists of unspun cotton fibers mixed intimately with the uncured resin and assembled around a steel hub having suitable projections for obtaining an adequate mechanical bond. The laminated rim is placed around the web portion and the whole assembly molded under heat and pressure which fuses it into a unit and cures the resin, making it infusible and insoluble. The resulting gear blank is then subjected to a heat-treating process which further cures the resin and shrinks the blank, so that subsequent changes in temperature will not make any changes in size other than the normal thermal expansion of the material. After this the blank may be machined and the teeth cut by the same methods as used in making metal gears. The resulting gear is not affected by hot oil and is impervious to moisture.

The mechanical properties of Textolite are such as to make it particularly well adapted to its application as a timing gear. The principal properties are as follows:

Tensile strength	10,000 lb. p. sq. in.
Compressive strength	
Laminations flatwise	40,000 lb. p. sq. in.
Laminations edgewise	26,000 lb. p. sq. in.
Modulus of rupture (bending strength)	
Laminations flatwise	20,000 lb. p. sq. in.
Laminations edgewise	19,000 lb. p. sq. in.
Modulus of elasticity	750,000 lb. p. sq. in.
Density	.05 lb. p. cu. in.
Coefficient of expansion (0-100°C)	
Laminations flatwise	0.00009
Laminations edgewise	0.00002
Rockwell Hardness (60 KG on ⅛-in. ball)	90B-97B.

Figs. 8, 9 and 10—Trochoidal path of corner of driven gear tooth with respect to driving gear. All gears cut with same 10-pitch, 14½-deg. standard hob. Driving gear has 25 teeth, 25-deg. 33-min. left-hand helix angle, 2.771-in. pitch diameter, 0.200 in. working depth. Driven non-metallic gear has 50 teeth, 25-deg. 33-min. right-hand helix angle, 5.543-in. pitch diameter, 0.200 in. working depth

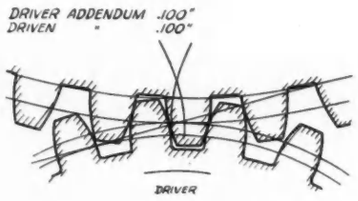


Figure 8

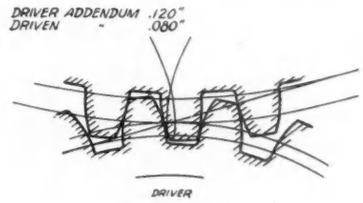


Figure 9

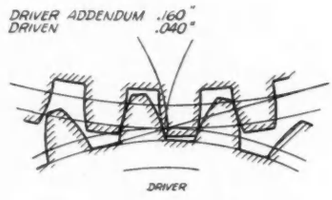


Figure 10

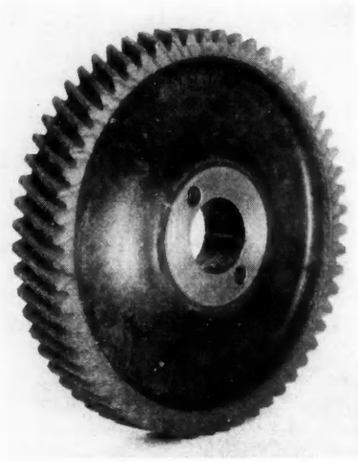


Fig. 7—Non-metallic gear of economical design. The face width is slightly greater than the hub length, which allows of stacking on arbor of hobbing machine. Two puller holes tapped in front of hub. No holes in web for thrust-bearing adjustment

The most valuable of these characteristics are the lightness and elasticity of Textolite. It is one-half as heavy as aluminum and forty times as elastic as steel. Even though modern motor car engines have been made far smoother in operation than ever before by the use of a greater number of cylinders, more rigid crankshafts, and vibration dampers, there is still some pulsation of crankshaft speed which is transmitted to the timing drive. This pulsation must be taken up by the camshaft drive in two ways, by following the pulsations and by deflection of the gear teeth and web. If the camshaft and gear had no inertia they would follow the pulsations of crankshaft speed perfectly and no pulsating stresses would be set up thereby. On the other hand, if the camshaft and gear had very high inertia, the pulsations would be taken up entirely by the deflection of the gear teeth and web, which would result in corresponding stress pulsations. The lightness of the Textolite gear brings the moment of inertia of the camshaft system to a minimum and the high elasticity allows deflection with minimum stress. Thus, the most desirable place to put the Textolite gear is on the camshaft. The mating crank and generator gears, of course, are steel or cast iron.

In designing a timing gear train the procedure is to determine the loads and then choose the tooth pitch, face and helix angle. The loads carried by the camshaft gear may be widely different on engines of different design. In addition to the smooth loads, such as friction in the camshaft and valve assembly, generator, oil pump, water pump and fan, there is a considerable torque pulsation caused by the spring and inertia loads of the valve system. The curves in Fig. 1 and Fig. 2 show, respectively, the load as measured by the dynamometer, and the calculated pulsations caused by valve spring and inertia forces for a four-cylinder L-head engine of about 200 cu. in. piston displacement, in which the other accessories such as fan, generator and water pump are belt-driven from the crankshaft. This is the simplest and easiest timing gear drive. Contrasted to this is the three-gear timing drive used on a six-cylinder engine of about 300 cu. in. displacement having overhead valves. The fan and oil pump are driven from the camshaft and the generator and water pump from the third shaft. Figs. 3 and 4 show the smooth loads and the calculated pulsa-

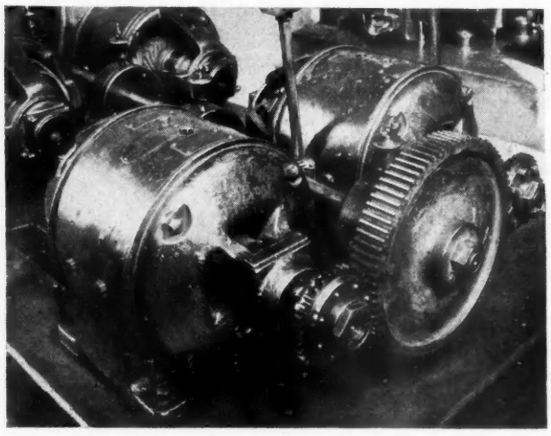


Fig. 11—Motor-generator set as used for life tests of Textolite gears

tions. Both of these engines have shown very long timing gear life in actual service. Fig. 5 shows the calculated pulsations for an eight-cylinder engine, assuming it to have the same valve assembly per cylinder as used for Fig. 4.

The curves in Fig. 6 show the safe working load per inch of face for Textolite gears having 50 to 60 teeth of 8 and 10 normal diametral pitch and 14½ deg. normal pressure angle. If teeth have 20 deg. normal pressure angle, these allowable loads may be increased 17 per cent. On most timing gear drives the teeth range in size from 8 pitch to 10 pitch, and the camshaft gear has from 50 to 60 teeth. For larger numbers of teeth, the values given on the curve are slightly more conservative.

The helix angle should be large enough to allow helical overlap of at least one circular pitch. In other words:

$$\theta > \text{Arctan} \frac{\pi^d}{FN}$$

where θ = helix angle.
F = face width in inches.
d = pitch diameter in inches.
N = number of teeth.

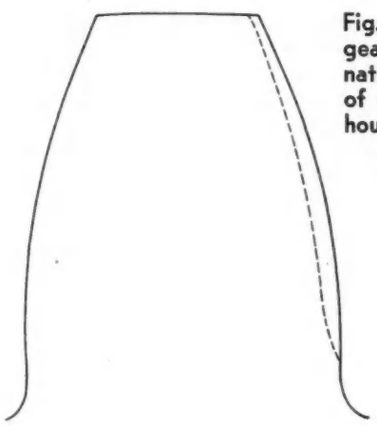


Fig. 12—Outline of gear tooth showing nature and amount of wear after 3100 hours under 67 per cent overload

In practice, helix angles from 20 deg. to 45 deg. have been used. The larger the helix angle, the greater the amount of overlap and, in general, the quieter the gear train, but also the greater the end thrust which must be taken up. The end thrust equals

$$W \tan \theta$$

(W = tangential load in pounds at pitch line)

and rises very rapidly as the helix angle increases above 30 deg. The web must be designed to withstand the end thrust without excessive deflection. This means that more material must be used in the web for higher helix angles, which results in increased cost.

Another design factor which affects the cost is the drilled holes in the web of the camshaft gear for getting at the screws in the thrust plate. Engine designs in which the front camshaft bearing takes the thrust, avoiding the necessity of these holes, allow a much more economical use of material in the gear web and a correspondingly lower cost. Fig. 7 shows a gear of this type.

That the design of gear teeth can be altered from the traditional standard to give longer life and more load capacity has been pointed out by the A.S.M.E. Special Research Committee on the Strength of Gear Teeth. One of the chief causes of wear and noise in gear teeth, especially where a flexible material is used, is the interference between the edge of the driven tooth and the flank of the driving tooth during their movement through the arc of approach. The path of the edge of the driven tooth with respect to the driving gear where standard proportions are used is shown in Fig. 8. This path is in the form of a trochoid which passes very close to the flank of the driving tooth, so close, in fact, that a slight deflection of the gear teeth will cause

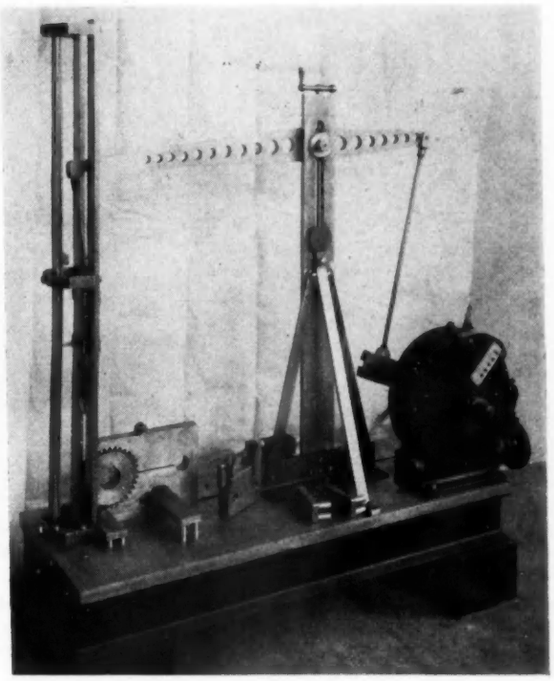


Fig. 13—Drop-hammer for testing teeth of Textolite gears under impact loads

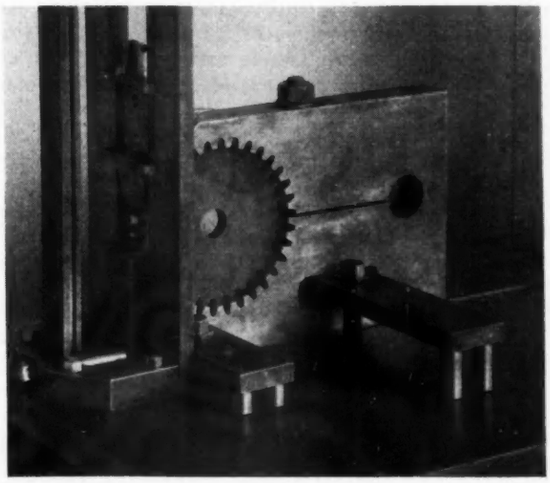


Fig. 14 — Detail of drop-hammer test

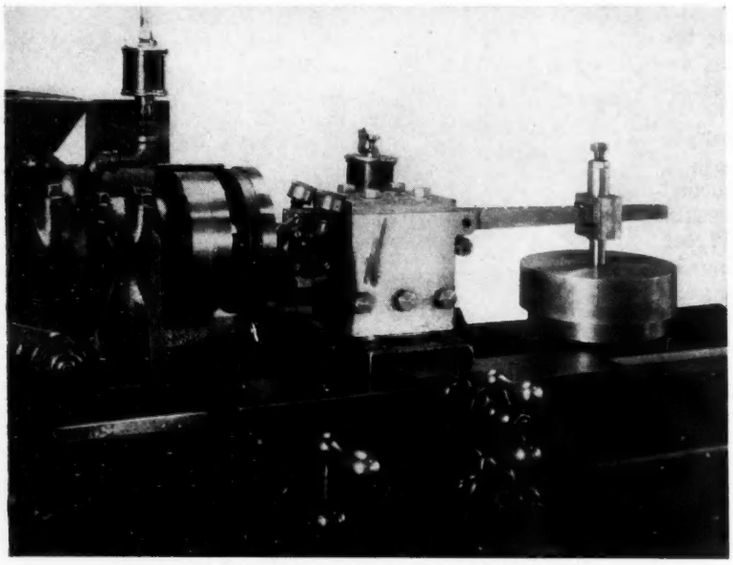


Fig. 15—Machine for testing non-metallic gear blanks for resistance

interference and cutting. Where the driving gear is steel or cast iron and the driven is Textolite, actual cutting does not take place because of the compressive elasticity of the Textolite, and the only objection is that the interference may cause some noise. On the other hand, where Textolite is the driver and metal the driven, the entering edge of the metal tooth may scuff the flank of the Textolite tooth and shorten its life. If, however, the ratio of addendum to dedendum is increased on the driver and correspondingly decreased on the driven gear, the loop of the trochoidal path becomes smaller (see Figs. 9 and 10) and finally disappears when the driver is made all-addendum and the driven all-dedendum. It appears desirable then, in a two-gear timing drive, to make the crankshaft gear with long addendum and short dedendum, and the camshaft gear with short addendum and long dedendum to match. The limit, of course, is to make the driver all-addendum, but this may not be practical on account of excessive undercut on the driven gear. However, it is desirable to go as far in this direction as other conditions will permit. One manufacturer has been using this design with good success for some time. It is possible to carry this principle into the design of a three-gear drive, but to our knowledge no one has made application of it.

A series of tests on Textolite gears and blanks has been devised which indicates quite well the properties of the material to withstand the duty imposed on it in a timing gear drive. Any change in materials or method of manufacture must show superior performance under these tests before it is adopted in regular production.

In general, there are three main qualities which are checked by the tests. First, the ability of the gear to withstand the wearing action of combined sliding and rolling friction must be as high as possible; second, the resistance of the gear teeth to impact loads must be a maximum; third, the resistance of the material to the fatigue of repeated flexing must be satisfactory. In addition to these characteristics, the material must have good machinability, low water absorption, and uniform hardness, and must not change shape permanently with repeated heating and cooling. (Of course, the normal thermal expansion is inevitable.) Minor tests to determine the static strength of the gear web, teeth, bond between web and hub, and the flexibility of the gear under axial loads, are made, but these do not show the ability of the material to give satisfactory performance as a timing gear as well as the first three tests.

Fig. 11 shows one of the motor-generator sets used for the wear test. The test gears, one of standard material and the other of comparison material, are mounted on the two machines and accurately meshed with a hardened and ground steel idler gear. After each hundred hours the gears are removed, measured, and exchanged as driver and driven, the same side of the teeth carrying the load in both cases. Every 24 hr. the gears are lubricated by painting the teeth with heavy graphite grease. The Textolite gears are 6 pitch, 33 teeth, 0.5 in. face, 14½ deg. pressure angle spur gears, all cut with the same hob. According to accepted practice, these gears are good for 4.65 hp. at a pitch line velocity of 2665 ft. per minute. Actually, the pitch line load is 99 lb. or 7.75 hp., an overload of 67 per cent. On the worn teeth there is no sign of pitting or scuffing—just a smooth, polished surface showing slow, uniform wear. The rate of wear of standard test gears is about .0057 in. at the pitch line per thousand hours of running. Fig. 12 shows a comparison of the original profile with the worn profile after 3100 hr. on this test.

To test Textolite gears for impact strength, the device shown in Fig. 13 is used. Standard test gears are made 6 pitch, 33 teeth, 0.5 in. face, all cut with the same 14½ deg. straight-side hob. A fixture is used (Fig. 14) which clamps the test gear securely while a drop hammer is allowed to fall, repeatedly striking the gear tooth about 1/64 in. above the pitch line. The

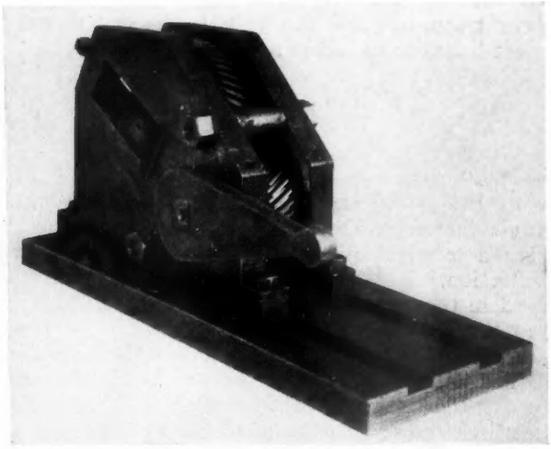


Fig. 16 — Fixture for testing relative strengths of web, teeth, hub-bond and key of non-metallic camshaft gear

weight of the hammer and length of the drop are constant for all tests, and are so chosen that slight variations in the elasticity or strength of the teeth cause very wide variations in the number of blows necessary to break the tooth. This test has been extremely valuable in the development of gear material with high strength combined with low modulus of elasticity which results in maximum ability to withstand shock loads.

As an example of the magnitude of stress set up by impact loads taken by contact of steel on steel, compared to contact of steel on Textolite, assume a given amount of impact energy to be absorbed by two steel members coming in contact and let the resulting maximum stress be called 100 per cent. If the same amount of impact energy is absorbed by impact of steel on Textolite, the resulting maximum stress is only about 22 per cent, because of the greater elasticity of Textolite. If the impact is between steel and cast iron, the maximum stress will be about 82 per cent, and between cast iron and cast iron 71 per cent.

This feature is most important in any non-metallic gear, since it is the resilience of the material, coupled with strength and lightness, which accounts for its success in a timing drive.

The third test is one which shows the ability of the gear web to withstand the fatigue of repeated flexing caused by the thrust component of pitch-line load on helical teeth. The method used is to mount the gear blank on a spindle turning at 1720 r.p.m. and apply a thrust load by means of weights and levers through a roller shoe to the face of the rim. The test is continued until failure of the web occurs. In order to keep the roller shoe from burning the Textolite rim, it is necessary to place a loosely fitting steel ring on the rim face for the roller to run on. Fig. 15 shows the construction of the device.

This test may be run in either of two ways. The first is a comparison test. A load is chosen which will destroy one type of gear blank in about 50 hr., after which other blanks of the same size, but different construction, may be run to compare their life with that of the first type. The second is a test to determine the endurance limit of the web—or the flexing load which the blank will carry indefinitely. This is done by testing several samples of identical type and construction with different loads, starting with one which will destroy the blank in a short time—then decreasing the load on the next one, and so on until a load is found which will be carried without failure by the sample for, say, 100,000,000 stress cycles. A curve may be plotted of load vs. life, which will indicate the endurance limit which may be expected. The gear blanks are designed so that the endurance limit is several times the maximum thrust load which the gears will be required to carry under normal operating conditions.

As a practical check on the above tests, timing gears are run in our laboratory on engines operating at high speeds on test stands.

Fig. 16 shows the fixture which is used to determine the relative static strength of the gear web, teeth, and bond between web and hub. The Textolite gear is keyed solidly to a fixed shaft and torque is applied by a steel mating gear.

Firing Foremen In Factories Is An Expensive Pastime

(*Continued from page 623*)

decision on some question concerning a tool change, the need for an improvement in method, or the need for tearing down a busy machine for repair. His skill, his enthusiasm, his willingness to cooperate, all have a bearing on his reaction to the emergency. One works manager estimates that thousands of dollars a day in his plant hang in the balance on this single element.

Naturally, it is more difficult to measure even the tangible effects in many plants which have not yet adopted some simple but adequate form of budget control. It is not the function of this article to sell you on the idea of the budget—although maybe it may do just that. The point is that we have demonstrated the practicability of estimating the dollar value of the foreman in exactly the same fashion as you would gage the effectiveness of one of your productive machines.

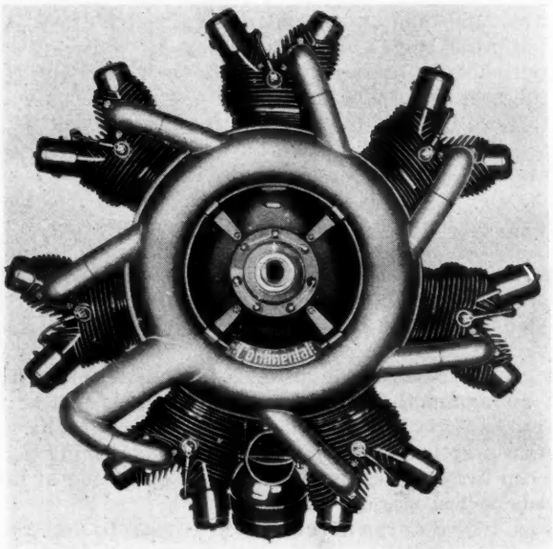
It may not cost you as much to train your foreman as it did in the case of the larger plant, but it costs something. How much you can't tell until you investigate.

Perhaps you are curious to know what can be done about this. Well here is something to think over. Inasmuch as the foreman represents a definite investment, why not take steps to safeguard this investment in the same way as you would protect machinery? One way is to set up a fund out of which foremen would be paid in slack seasons, thus keeping them on the payroll regardless of business conditions. Enforced layoffs, wage cuts and other expedients are not calculated to preserve the right mental attitude of the men on the firing line. At least that is the opinion of many works managers.

In conclusion, the cost of labor turnover may be summarized in the following way: If the tendency of overhead costs is carefully watched, it is possible to determine accurately the net effect of a budget control over a brief period. The improvement in dollars is reflected in the comparison of present costs with the costs when the system was first installed. If you take the example given earlier, you can assume that a new man may have to operate on the costs prevailing at the beginning, at least until he is well acclimated. Your guess as to how long the period of acclimatization might be is as good as anyone else's. One man places it at two years.

Whether you agree that it costs $5,000 or $10,000 or nothing at all to train a foreman, here seems to be a tangible and practical method of checking it. Your comments on this important question will be of great interest. May we hear from you?

Continental Aero Engine Develops 215 Hp.



CONTINENTAL AIRCRAFT ENGINE CO. has developed an enlarged version of its well-known Model A 70 aircraft engine, known as Continental R-670, for which it has been granted Department of Commerce approved type certificate No. 80. The new engine has a bore of 5⅛ instead of 4⅝ in., the stroke, 4⅝ in., being the same as that of the Model A 70. By thus increasing the bore, the displacement has been increased from 544 to 668 cu. in. and the horsepower from 170 to 215. The total dry weight is 425 lb., which is only 25 lb. more than that of the A 70 and makes the specific weight 1.98 lb. p. hp.

Installation dimensions are the same as those of the A 70, which will appeal to aircraft manufacturers that may want to replace the A 70 by the new R-670 in their program. The cylinders and pistons, of course, are different from those of the earlier model and the piston is now of the permanent-mold instead of the semi-permanent-mold type. A 3/16-in. Perfect Circle oil ring is now used in the third piston-ring groove (instead of a ⅛-in. ring) and Perfect Circle compression rings are used in the first, second and fourth grooves.

A new feature of the design of the engine is a chevron-packed tappet. This tappet embodies two chevron-section packing rings seated in a gland in the tappet guide by the spring load on the pushrod housing. This construction is said to have been found very successful in preventing oil leakage at the tappets.

In the new engine the intake manifold and oil sump are incorporated in the rear crankcase section. The oil sump is of greater depth, to accommodate a greater quantity of oil without spilling over into the cylinders, and a drilled passage from the scavenge pump has been arranged to suck from the bottom of the sump. To clean up the nose of the engine and conform with military requirements, the breather has been moved from the crankcase front to the accessory case.

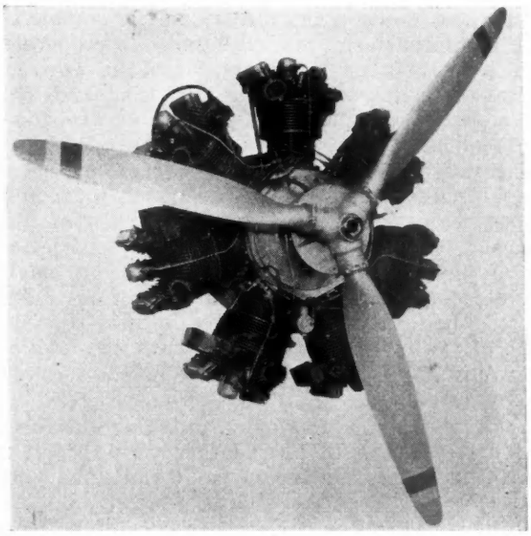
The Stromberg NAR6 replaces the NAR5 carburetor, and a standard reinforced fine-mesh screen is employed in the oil filter instead of the stacked-disk element that was fitted to the A 70 engine.

Radial Diesel Starts From Cold

A SEVEN-CYLINDER radial air-cooled Diesel aircraft engine has been built by the Aviation Diesel Engine Co., Ltd., Los Angeles, Calif., and is said to have been operated nearly 400 hours to date. It is of 7 in. bore and stroke, and is rated as of 400 hp. at 1500 r.p.m. (This implies of b.m.e.p. of 112 lb. p. sq. in.). Employing regular Diesel fuel of 27 deg. Baume, the fuel consumption is said to be about 0.4 lb. hp.-hr. A compression of 450 lb. sq. in. is carried and the engine starts directly from cold, an electric inertia type starter being used.

The pistons are of aluminum alloy, while the crankshaft and other similar parts are made of vanadium steel. The crankshaft is made in two parts, while the master connecting rod is a one-piece forging which is bored out to receive the babbitt-lined bronze crankpin bearing. The crankcase and both of its end plates—which carry the roller bearings for the crankshaft—are made of alloy steel. Cylinders also are made of alloy steel and have the aluminum-alloy cylinder heads screwed over them, with a shrink fit.

Air and exhaust valves are located in the cylinder head and are operated by pushrods from a cam ring in the crankcase in the usual way. The fuel nozzle is



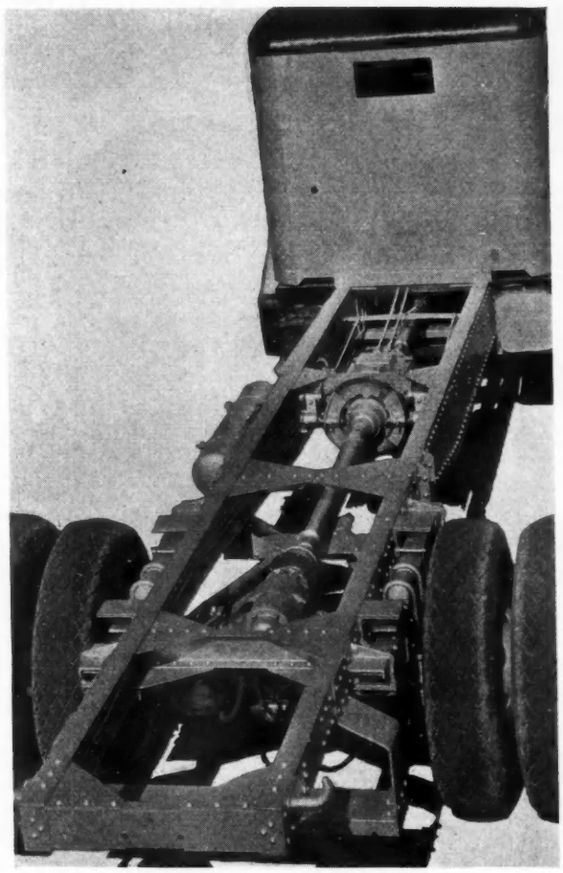
set into the cylinder head on the cylinder axis. Separate control mechanisms are provided for quantity and

timing of injection, and both mechanisms are inclosed in the cam housing without protruding parts.

The fuel injection pump furnishes fuel under controllable pressure to a fuel header from which it is delivered to the individual cylinders. Between the fuel pump and header are provided a fuel strainer, fuel by-pass, and accumulator. The injection nozzle is made without packing and has a nitralloy valve lapped into a nitralloy bushing.

Ross McCollum is president of Aviation Diesel Engine Co., Ltd., and John Suter, the designer of the engine, is vice-president. It is planned to bring out an in-line water-cooled Diesel engine for automobile and motorcoach use.

Duralumin Used Widely on Two Trucks

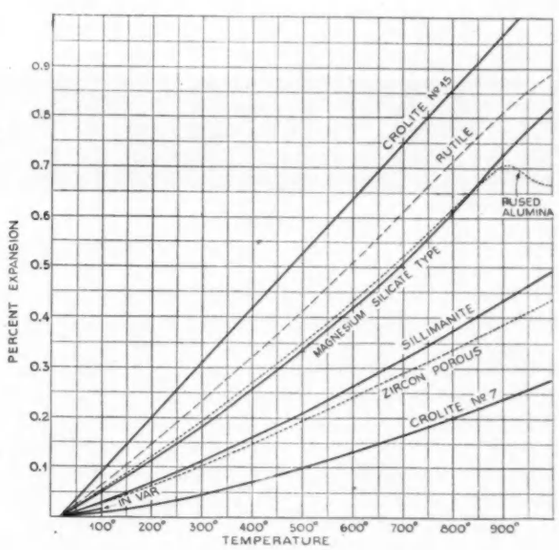


TWO trucks for the delivery of valuable freight—silk and silk stockings from Reading, Pa., to New York City—were built recently by the Ward-LaFrance Truck Corp., Elmira, N. Y., for the Bingaman Motor Express Co. of Reading. Liberal use of duralumin is made in the construction of these trucks, and much weight is saved thereby. The photograph clearly shows the construction of the frame, the side rails being riveted together of angles and plates. This construction in steel has been used by the Ward-LaFrance Truck Corp. for the past two years, but in this case the members are of duralumin. The side rail is 14-in. high at the center and 8-in. over the axle, which permits adequate axle clearance with low loading height. The engine is a Waukesha of 5-in. bore and 5¾-in. stroke, with special light-weight pistons and high-compression heads. A dual Brown-Lipe transmission is fitted. The hand brake is of the American Cable Company's Tru-stop disk type with double shoes, and the foot brakes or service brakes are air-operated, by Westinghouse equipment. A rather unique radius-rod construction is employed. The radius rod or thrust member is supported at its forward end by a 4½-in. ball suspended from a drop member of the frame which together with another cross member above it forms a box girder.

The cab of this truck is of bullet-proof construction, both the walls and the window glass being bullet-proof. It has gun slots and special ventilating features. By the substitution of duralumin for crucible steel in the bullet-proof cab a saving in weight of 2000 lb. was made and the chassis weight was reduced by 1500 lb. as compared with the standard type.

Crolite Has Low Coefficient of Expansion

HENRY L. COWLEY & CO., West Orange, N. J., has developed a new ceramic material known as Crolite No. 7 which has a lower coefficient of heat expansion than any previously known material. Its coefficient of heat expansion is only one-fourth that of Sillimanite (a porcelain used for spark plug insulators) at 100 deg. C., and only one-half that of the metallic alloy invar. As a natural consequence of its possession



of a low coefficient of heat expansion Crolite No. 7 is said to be remarkably free from internal stresses due to sudden temperature changes. This characteristic makes it suitable for use as a spark plug insulator, and particularly for the insulators of spark plugs intended for use in aircraft engines, which are exposed to extremely severe service conditions.

Automotive Oddities—By Pete Keenan

SKAGWAY STREET CAR BUILT OUT OF FORD PARTS BY MARTIN ITUEN.
NOTHING LIKE IT THE WORLD
868969 LICENSE NUMBER OWNED BY L.E. COLE OF ORION, MICH. ALSO READS 696898 UPSIDE DOWN.
JIMMIE WEDELL. SAVED HIS LIFE BY JUMPING FROM A PLANE WHILE IT WAS BREAKING A WORLDS SPEED RECORD April 1932. (His altitude was) only 500 feet
SURVEYORS OFTEN HAVE TO FIND THE ROAD'S AFTER A SNOW STORM IN COLORADO SO THAT THE SNOW-PLOWS CAN GET TO WORK.

Write us if you know an "Oddity"

The News Trailer

The Province of Quebec in Canada is about the last stronghold of his late majesty, the horse. But even in "P.Q." the horse is losing ground. Recently published figures show a decline in the horse population of the province to 304,537, a decrease of 27,996 in 10 years. But there are parts of Quebec which will resist for a long time the inroads of the motor vehicle. The *habitant* farmer is one of the most conservative people in the world, and he knows that when the automobile comes, and his children begin riding into the larger towns, the purity of his beloved seventeenth French tongue will be corrupted.

Last year, in summer, we made the circuit of the celebrated *Boulevard Perron,* which was opened up about three years ago to give eastern Quebec a highway outlet to the larger cities which they had not had until then. There are scores of towns in the Eastern peninsula which average about one gasoline pump apiece, and the product they dispense is not "fresh gasoline" by any means. The automobile dealer is unknown, and repair shops are lucky to be equipped with an air pump. The big equipment jobbers in Montreal and Quebec are not asleep, however, and are rushing into cultivation of one of the world's few virgin automobile markets.

Engineers and executives of the Societe Anonyme Andre Citroen, Paris, are always flitting back and forth across the Atlantic. One such delegation is currently quartered in an automotive center. One of M. Citroen's *regles du maison* is that his executives must learn to speak English (and particularly American) fluently. One of the younger men in the present visiting party was hard put for the "secret" of acquiring fluent American. *"Tiens, tiens,"* cries he one day, and went out and bought several packages of chewing gum. Religiously chewing "after every meal" (these instructions were kindly translated for him by another member of the party) he confidently awaits the day when the magic virtues of these "choo-eeng goom" will enter into his being, and he shall be truly "one of the boys."

This week there came the first 1932 edition of *Hot Racing News.*—H.H.

NEWS

Willys in Toledo

TOLEDO, April 21—On his arrival here today from New York, John N. Willys said that he had nothing further to add at present to the statement already given to *Automotive Industries*. He stated that he is maintaining an "open mind" on the question of future active participation in the Willys-Overland Co. and will probably hold numerous conferences with his aides at the plant before reaching a decision.

Traffic Managers Consider Rates

Plan Appearance in Protest Before Classification Group

DETROIT, April 18—At the N.A.C.C. traffc managers' meeting held here April 14, plans were made for appearing before the Railroad Classification Committee at Chicago, May 3, in opposition to proposals, by the railroads, to increase the ratings on nearly 100 items in the classification that are used actively by the factories in shipping parts to the factories, assembly plants and service stations.

J. S. Marvin of the N.A.C.C., who presided at the meeting, stated that there was a possibility that the case will go on from the Classification Committee to the railroad executives and possibly to the Interstate Commerce Commission, as it opens up the whole question of freight costs on materials used in the manufacture of cars and trucks.

Another action of the meeting is in the question of mining carload weights applied by the railroads to shipments of automobiles. The railroads have always worked under a rule whereby the minimum weight is progressed at about 3 per cent per foot in excess of 36 ft. when longer freight cars are used. When the 50-ft. cars are used, there is an extra minimum of 1000 lb. In the meantime, it has been necessary to make numerous exceptions to meet conditions in shipping to the Pacific Coast and certain other territories, and more recently, these exceptions have spread into the rates made to meet truck competition. There have also been many complications in the application of the rule, permitting use of longer cars when shorter cars are not available, and the industry will seek a simplified tariff that will eliminate these difficulties. It is felt that the answer probably lies in grouping cars for two minimum weights and freight governed by whatever car is actually used.

Reporting on recent hearings before railroad executives, the Rate Committee announced that more favorable rates will soon be effective on shipments of batteries and on upholstering materials.

Factories represented at the meeting were: Auburn, Buick, Cadillac, Chevrolet, Chrysler, Dodge, Federal, General Motors Truck, Graham-Paige, Hudson, Hupp, International Motor, Lincoln, Reo, Studebaker, White; K. A. Moore (N.A.C.C.) and J. S. Marvin, chairman of the conference.

W. S. Graham Leaves Hupp

William S. Graham has retired as vice-president in charge of manufacturing of the Hupp Motor Car Corp., according to an announcement by DuBois Young, president and general manager.

Mr. Graham plans to retire from active work for an indefinite period, due to impaired health. Believing that a rest and change of climate might be beneficial to him, he has planned a trip to Europe.

Speeds Lacquer Suit

WILMINGTON, DEL., April 21—E. I. du Pont de Nemours & Co. has informed licensees under its lacquer patents license contract that it is hopeful of getting its litigation with the Glidden Co. on the calendar of the district court sitting in Brooklyn, N. Y., in June, and to have it followed shortly by the Jones-Dabney suit.

Rockne Deliveries Gain

DETROIT, April 21—Retail deliveries of the Rockne car for the first 10 days of April were 31.8 per cent greater than for the previous 10-day period. Deliveries for the period ended March 20 gained 26.3 per cent over the previous 10 days, while the period ended March 31 showed a 58.3 per cent increase over March 20.

Graham Reports Profit

DETROIT, April 18—Graham-Paige Motors Corp. has reported first quarter earnings of $166,589, compared with a loss of $178,523 in the same period last year. A total of 6124 cars were sold during the first quarter this year against 6114 in the corresponding quarter last year.

Plane Production Drops 2 Per Cent in Jan.-Feb.

NEW YORK, April 19—Production of commercial and military airplanes and engines during January and February attained a value of $4,689,496, according to the Aeronautical Chamber of Commerce. This represents a drop of 2 per cent from the figure of $4,782,-961 in 1931, and compares with $5,-486,399 in 1930.

Sales during the two months were 17 per cent less than the previous two years under comparison. Military orders account for 84 per cent of the total manufacturing income since the first of the year. Actual production figures for February were 40 commercial planes and 90 military planes, 66 commercial airplane engines and 110 military engines.

U. S. Rubber Elects Mahoney

U. S. Rubber Co. at the annual stockholders meeting elected Walter B. Mahoney a director to succeed Matthew C. Brush. Mr. Mahoney is president and editor of the *North American Review* and was formerly director and counsel of United States Rubber Plantations, Inc.

Packard Transfer Approved

DETROIT, April 18—At the annual meeting of stockholders of Packard Motor Car Co., held here yesterday, the recommendation by directors to transfer $10,000,000 from capital to surplus, was approved. Directors and officers were reelected.

Changes in Values of Automotive Securities on New York Stock Exchange During March, 1932

NAME OF GROUP	COMMON STOCKS No. of Companies	No. of Issues	Average Price	Total Shares Listed	Total Market Value	PREFERRED STOCKS No. of Issues	Average Price	Total Shares Listed	Total Market Value	ALL STOCKS No. of Issues	Average Price	Total Shares Listed	Total Market Value
Automobile & Truck Mfg. Cos. (and Holding Cos.)	22	22	$10.76	83,304,357	$896,227,502	7	$69.40	2,363,475	$164,029,906	29	$12.38	85,667,832	$1,060,257,408
Automobile Access. Mfg. Cos. (and Holding Cos.)	35	35	7.02	22,236,177	156,113,208	5	25.78	297,409	7,667,687	40	7.27	22,533,586	163,780,895
AUTOMOBILE INDUSTRY ..... TOTAL	57	57	9.97	105,540,534	1,052,340,710	12	64.53	2,660,884	171,697,593	69	11.31	108,201,418	1,224,038,303
Petroleum & Natural Gas Cos.	42	44	11.74	169,315,751	1,988,354,900	12	34.50	2,178,815	75,176,319	56	12.03	171,494,566	2,063,531,219
Petroleum & Natural Gas Holding Cos.	3	3	4.37	3,505,969	15,329,430					3	4.37	3,505,969	15,329,430
PETROLEUM INDUSTRY ..... TOTAL	45	47	11.59	172,821,720	2,003,684,330	12	34.50	2,178,815	75,176,319	59	11.88	175,000,535	2,078,860,649
AIRPLANES-A'WAYS-A'PORTS TOTAL	9	9	4.21	16,479,490	69,384,650	2	9.16	1,381,359	12,654,708	11	4.59	17,860,849	82,039,358
Omnibus Operating Cos.	3	3	6.29	1,085,335	6,829,672	1	65.25	88,861	5,798,180	4	10.75	1,174,196	12,627,852
RUBBER TIRE & GOODS INDUSTRY ..... TOTAL	8	8	5.74	9,680,177	55,540,356	10	28.47	2,659,979	75,721,889	18	10.64	12,340,156	131,262,245
FARM MACHINERY INDUSTRY. TOTAL	7	6	14.21	8,086,516	114,935,701	5	33.35	3,144,750	104,887,003	11	19.57	11,231,266	219,822,704

From April Bulletin of New York Stock Exchange

Power Boat Racing Charges Sifted

NEW YORK, April 20—American Power Boat Association, through Charles F. Chapman, secretary of its racing commission, has declared the findings of the inquiry held in Sanford, Florida, to investigate reports of unfair driving by nine American outboard pilots in the Col. E. H. R. Green Star Island Trophy race last month, as correct, but issues a statement in which it emphasizes its determination to eliminate dishonesty and questionable practices for motor boat racing in this country.

Charges thrashed out in this inquiry included one that a successful plot was utilized to lure one of the British racers over the line into a disqualification and another that the ignition cable of one of the Italian drivers was tampered with prior to the race.

Chevrolet Sales Up

DETROIT, April 21—Chevrolet dealers sold 17,452 cars and 26,573 used cars during the first 10 days in April, which made it the best 10-day period this year, and exceeded sales for the first 10 days following the announcement of the new car last December, according to H. J. Klingler, vice-president and general sales manager. Sales in the April period were 4000 cars higher than for the previous 10 days and 88.7 per cent above sales for the corresponding period in March.

Knoble on Committee

Cliff Knoble, director of advertising, Chrysler Sales Corp., has been appointed chairman of the newspaper committee of the Association of National Advertisers. Mr. Knoble is also a director of the association.

Columbus Auto Has Loss

COLUMBUS, OHIO, April 21—Columbus Auto Parts Co., subsidiary of Electric Auto-Lite Co., Toledo, reports net loss of $40,435 for the year ended December 31, 1931, compared with net profit of $103,940 in 1930.

The company's record indicates that current assets were $262,500 and current liabilities were $30,800. Working capital had decreased from $425,200 at the end of 1930 to $231,700 at the end of 1931. Dividends were paid on preferred and convertible preference stock, but not on the common. The concern's capital structure remained unchanged during the period. Officers were reelected.

Hudson Sales Increase

NEW YORK, April 20—Hudson Motor Car Company has shown increased sales for five weeks, according to Chester G. Abbott, general sales executive of the company. Sales during the week ended April 16 were larger than for any week this year, including the weeks of the National Shows. Sales during the first two weeks of April were 34 per cent greater than during the first two weeks of the preceding month.

Bowl for Mooney Trophy

NEW YORK, April 20—General Motors Export Co. will hold its second annual international bowling match, Friday evening, April 29. On this occasion, teams at the various overseas plants and in New York will bowl and scores will be cabled into New York for conducting the match.

Contest is for the James D. Mooney Trophy which at present is held by the team in General Motors Argentina.

DeSoto Adds Coupe

DETROIT, April 21—Addition of a custom coupe, priced at $790, has been announced by the DeSoto factory. The new body type carries a rumble seat.

Ames Heads Duesenburg

H. T. Ames, who has been vice-president, sales and advertising manager of Duesenberg, Inc., Indianapolis, has been named president of the company. E. L. Cord, president of the Auburn Automobile Co., had been president.

Chassis Dynamometer Installed

NEW YORK, April 20—The Metal Stamping Co., 11th Street and 44th Ave., Long Island City, has installed in its plant a rear-wheel dynamometer with sufficient capacity to test cars with engines up to 250 hp. Tests may be made on new and overhauled cars for the purpose of checking the carburetor setting or the functioning of the ignition and lubrication systems. Reports on the tests are issued in which the powers at the driving wheels from the lowest to the highest car speeds are given. The tests are made under the supervision of Joseph Tracy.

Bohn Reports Loss

DETROIT, April 19—Bohn Aluminum and Brass Corp. has reported net loss of $73,201 after all charges, for quarter ended March 31, 1932, compared with a net profit of $437,296 in the same period last year.

Gets Chrysler Award

Holabird & Root, Chicago, have been designated winners in the architectural competition for design of the building and exhibit to be erected by the Chrysler Corp. at the Century of Progress Exposition in Chicago in 1933.

Indian Plans Campaign

NEW YORK, April 20—Indian Motocycle Co., Springfield, Mass., has announced a special sales campaign for the week of April 23 to May 1, which will be known as "Indian Wigwam Week," and dealers throughout the United States, Canada and Mexico will hold special open wigwam parties on both Saturdays of this period for all actual and prospective riders.

Jamieson Leaves Graham

S. E. Jamieson, manager of the business and technical division, Graham-Paige Motors Corp., resigned as of April 20.

Marine Activity Started

NEW YORK, April 20—The Marine Division of the Metropolitan section of the Society of Automotive Engineers was formally launched here this week. The meeting was held under the auspices of the Society of Automotive Engineers and was attended by George H. Townsend, president of the American Power Boat Association; Alfred E. Luders, chairman of the Technical Committee of the National Association of Engine and Boat Manufacturers; John A. C. Warner, general manager of the Society of Automotive Engineers; F. K. Lord, designer of racing craft; A. L. Beall, of the Vacuum Oil Co. and secretary of the Metropolitan section; C. H. Baxley, also of the Vacuum Oil Co.; William Young, chief engineer of the Consolidated Shipbuilding Corp.; A. W. Hagan, chief engineer of the Wolverine Motor Works; J. M. Homs, export manager of Lycoming Mfg. Co.; Frank Orr, Maxim Silencer Co.; N. E. Donnelly, chairman of the Dawn Boat Corp.; Jay Cothren, Metropolitan distributor for Chris Craft Corp.; George W. Sutton, Jr., of the National Association of Engine and Boat Manufacturers, and J. Edward Schipper, secretary-elect of the Metropolitan section.

An attempt will be made to secure Charles F. Kettering, vice-president of General Motors, as speaker at a meeting to be held in May.

New Jersey Gives Reciprocity

NEW YORK, April 18—The State of New Jersey has just enacted a new law granting to motor vehicles from other states reciprocal privileges to the same extent to which the state from which the cars come grants such privileges to New Jersey vehicles. In many cases this amounts to unlimited reciprocity.

Caterpillar Reports Loss

CHICAGO, April 19 — Caterpillar Tractor Co. reports net loss of $510,124 after all charges for the first quarter of 1932 compared with net income of $1,031,345 equal to 55 cents a share on 1,882,240 common in the 1931 quarter. Sales declined to $3,501,647 for the first three months of 1932 from $9,070,537 in the 1931 period.

In explaining the decrease in sales and earnings, B. C. Heacock, president, states the company has found it necessary to reduce prices on discontinued tractor models which were rendered obsolete by the extensive redesigning of its tractor lines during 1931. These price reductions have moved most of such tractors and have resulted in many of the first quarter sales being made at a low gross profit, Mr. Heacock states. In addition to this and the low volume of business, due to general conditions, it was also necessary to refund to dealers $366,385 because of the price reductions.

Petroleum Imports Down

NEW YORK, April 20—Imports of petroleum at the principal ports of the United States for the week ended April 16 have been estimated by the American Petroleum Institute at 252,000 barrels daily. This compares with the daily average of 340,429 barrels for the week ended April 9, and with 369,143 barrels daily for the four weeks ended April 16.

Crude runs to stills during the week are placed at 2,272,600 barrels daily. Cracked gasoline produced during the week was placed at 3,106,000 barrels.

Stocks of gasoline at bulk terminals and in transit, east of California, for the week ended April 16, totalled 14,716,000 gallons, as compared with 14,526,000 gallons for the previous week, and with 12,846,000 gallons for the week ended April 18, 1931.

Massey-Harris Aids Its Creditors, Cuts Prices

TORONTO, ONT., April 18—Massey-Harris Co., largest manufacturer of agricultural implements in the British Empire, has made an offer of a flat 10 per cent cut in the price of all new implements sold this year for which payment is made up to Nov. 30, and has added another offer to strike off 10 per cent from all debts accumulated by its customers in the past. The same date applies to debt cutting, that is, payment must be made by Nov. 30. The offer represents a possible gift of $2,529,000 to farmers in various parts of the world who in other seasons purchased Massey-Harris equipment. The company's latest report shows bills and accounts receivable of $25,297,863 and the 10 per cent reduction will apply to the whole or any portion of that sum upon which payments are made.

Eaton Reports Profit

NEW YORK, April 18—Eaton Mfg. Co. and Wilcox-Rich Corp. report net income for the quarter ended March 31 of $57,521. This is equivalent, after prior dividend requirements, to 4 cents a share on common stock, and compares with earnings of $217,373 or 30 cents for the previous year.

Diamond T Shipments Up

CHICAGO, April 19—Shipment of Diamond T trucks during the first quarter were 13 per cent ahead of the corresponding period in 1931, C. A. Tilt, president, Diamond T Motor Car Co., announces.

Virginia Code Revised

NEW YORK, April 18—The State of Virginia has recently enacted a number of new laws covering the registration and operation of motor vehicles. One of these calls for the issuance of certificates of convenience and necessity to interstate carriers, and specifies the conditions under which such issuance be made.

Another one imposes a tax on all rolling stock of motor vehicle carriers on an assessed valuation basis.

The third provides for regulation of common carriers for passengers and property, while still another new law imposes additional taxes on this type of vehicle. A new registration fee law raises the rates on vehicles of 2½ tons or more. The new rates go up to $1,150 for 10-ton vehicles.

Virginia has also adopted a new reciprocity law which gives complete reciprocity to foreign passenger cars for 90 days, with the stipulation that if they are to be in the state more than 30 days, they must secure a special permit before the 30 days are up.

No reciprocity is granted to common carriers of property or passengers. Any foreign motor vehicle operated not for pleasure may enter the state three times within one calendar month but requires permits for this entry.

Col. Green Advanced

The appointment of Col. George A. Green, formerly vice-president in charge of engineering of General Motors Truck Co., to the position of vice-president in charge of operations has been announced by Paul W. Seiler, president.

Col. Green will remain in charge of engineering activities, in addition to the direction of manufacturing operations, the latter position formerly held by Frank V. Hadas, who recently resigned.

Col. Green joined Yellow Coach and Mfg. Co. as vice-president in 1922, after resigning from Fifth Avenue Motor Coach Co., New York. He is a member of the technical committee of General Motors Corp. and a director of the Yellow Truck and Coach Co.

Farr Joins Carter

Carter Carburetor Corp. has announced that H. W. Farr, formerly assistant general sales manager of the Marvel Carburetor Co., has joined Carter ranks as sales engineer, assigned to special accounts in the Detroit area.

Dr. James E. Mead

DETROIT, April 18—Dr. James E. Mead, 58 years old, chief surgeon of the Ford Motor Co. since 1909, died yesterday.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, April 20—There was no material change in business last week. Developments in Congress are being watched closely. There was an advance in the grain markets last week, particularly wheat, as a result of the bad crop reports in the Southwest, where rain has been very scarce this spring.

DEP'T STORE SALES

The Federal Reserve Board's adjusted index of department store sales during March stood at 74, as against 79 for both February and January. The value of March sales was 20 per cent below that a year ago.

CAR LOADINGS

Railway freight loadings during the week ended April 2 totaled 544,961 cars, which marks a decrease of 16,157 cars below those during the preceding week, a decrease of 182,891 cars below those a year ago, and a decrease of 363,098 cars below those two years ago.

CONSTRUCTION AWARDS

Construction contracts awarded in 37 Eastern States during March, according to the F. W. Dodge Corporation, amounted to $112,234,500, which marks an increase of 26 per cent above those during the preceding month but a decrease of 70 per cent below those a year ago.

BUSINESS FAILURES

Commercial failures during March, according to R. G. Dun and Co., numbered 2,951, which marks an increase of 13.3 per cent above those a year ago. The liabilities involved in the March failures were 55.3 per cent above those a year ago and 64.9 per cent above those two years ago.

COTTON CONSUMPTION

Cotton consumed during March amounted to 542,884 bales, including linters, as against 502,782 bales during the preceding month and 554,512 bales a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended April 16 stood at 62.4, as against 62.5 the week before and 62.9 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended April 13 were 35 per cent below those a year ago.

STOCK MARKET

The stock market passed through another difficult period last week. The proposed transfer tax on security transactions and the Government inquiry into short-selling operations had the effect of encouraging liquidation. Trading was on a moderately large scale. As a result of the recovery in the latter part of the week, some issues closed the period with slight net gains.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended April 13 showed decreases of $6,000,000 in holdings of discounted bills and of $6,000,000 in holdings of bills bought in the open market. Holdings of Government securities increased $100,000,000. The reserve ratio on April 13 was 69.4 per cent, as against 70.8 per cent a week earlier and 70.9 per cent two weeks earlier.

Excise Taxes Protested to Senate; Treasury Wants Old, High Rates

WASHINGTON, April 21—Hardly had the leading motor-vehicle manufacturers of the country completed earnest pleas last Monday before the Senate Finance Committee against discriminatory excise taxes than Secretary of the Treasury Mills laid before it the Treasury's original program, with some "additional suggestions." The original program, it will be recalled, provided for taxes of 5, 3 and 2.5 per cent, respectively, on passenger automobiles, trucks and accessories. The rates carried in the present bill (now before the Senate), against which the motor manufacturers and motorists' organizations protested so strongly, are only 3, 2 and 1 per cent, respectively.

The Treasury head explained in a statement covering the summary of tax proposals that it was submitted at the request of Senator Harrison of Mississippi. Nevertheless, the fact that it was presented almost immediately after the motor interests had protested against the House bill taxes was considered to be a rather striking coincidence, if nothing more. Secretary Mills from the outset has adhered strongly to the 1924 motor excise taxes in his recommendations. He has done this despite their defeat in the House recently and despite their repeal in the past over the objection of the Treasury Department. He has done it despite the "sales letter" of President Hoover urging early purchase of automobiles by those contemplating such purchase. The President's suggestion was designed as an aid to the automotive industry in its spring drive with new models at the lowest prices in the industry's history and at enormous expense by the automotive industry which, it is freely admitted, is making a gamble in its effort to revive business and employment. These matters were disregarded by Secretary Mills.

It is a matter of speculation and nothing more as to what effect his summary and the manner of presenting it may have on the committee in eliminating or knocking down further the proposed excise taxes on motor vehicles and accessories. The secretary estimates that these particular taxes as recommended by him would raise $100,000,000 in revenue in the fiscal year 1933. The House bill rates are estimated to raise $56,000,000. The secretary, however, did make certain revisions in his program. He cut down the proposed tax of 1 cent per gallon on gasoline to ¾ cent per gallon. Originally he had proposed a tax of 7 per cent on electricity and gas, estimated to raise $94,000,000. Later he pared this down to a rate that would raise an estimated revenue of about $50,000,000. In his summary last Monday he entirely eliminated this item.

The Senate Finance Committee appeared to be sympathetic toward witnesses appearing for the automotive industry and motorists' association. The attack was led by George M. Graham, vice-president of Rockne Motors and spokesman for the taxation committee of the National Automobile Chamber of Commerce. Among others present at the hearing were Alfred P. Sloan, president, General Motors Corp.; Edsel Ford, president, Ford Motor Co.; Walter P. Chrysler, president, Chrysler Corporation; A. R. Erskine, chairman, Studebaker Corp.; Roy D. Chapin, chairman, Hudson Motor Car Co.; E. L. Cord, president, Auburn Automobile Co.; A. J. Brosseau, president, Mack Trucks, Inc.; Alfred H. Swayne, vice-president, General Motors Corp.; Robert C. Graham, vice-president, Graham-Paige Motor Corp.; T. R. Dahl, vice-president, White Motor Co.

The witnesses impressed the committee with the importance of leaving the industry to proceed unhampered by discriminatory taxes with its spring drive for revival of prosperity. It was pointed out that the industry is trying to sell cars that it may restore jobs to tens of thousands of those among the 4,000,000 dependent upon it for their livelihood and who are suffering severely today due to the enormously reduced payrolls and operations of the industry. It was pointed out by Mr. Graham that the number of employees in the industry has dropped from 590,709 to 340,000 and the payroll from $1,028,791,000 to $453,000,000.

Canadian Rubber Association Elects

TORONTO, ONT., April 18—At the annual meeting of the Rubber Association of Canada held recently the following officers were elected for the ensuing year: president, F. A. Eric Warren, president and general manager Gutta Percha and Rubber, Limited, Toronto; vice-president, E. P. Sergent, president Canadian Goodrich Co., Limited, Kitchener; Treasurer, H. C. Jeffries, president Viceroy Rubber Co., Limited, Toronto; assistant treasurer, C. A. Jones, general manager Sieberling Rubber Co. of Canada, Limited, Toronto; and manager, Arthur B. Hannay, Toronto.

Rickenbacker Joins G.A.C.

E. V. Rickenbacker has resigned from the General Aviation Corp. to become vice-president of the Aviation Corp. His headquarters will be in Washington, D. C. It is understood that his connections with the Indianapolis Speedway Corp. and the Contest Board of the American Automobile Association will be retained.

Registrations Down 2.8% Says Bureau

Public Roads Body Places 1931 Figure at 25,814,103

WASHINGTON, April 20—Motor vehicles registered during the year 1931 numbered 25,814,103. Owners paid registration and license fees of $344,337,654, according to reports from state agencies as collected by the Bureau of Public Roads, U. S. Department of Agriculture. This registration represents a decrease of 2.8 per cent from the 26,545,281 motor vehicles registered in 1930. Motor truck registrations were 3,466,303 as compared with 3,486,019 in 1930. The figures for 1931 do not include 172,250 tax-exempt official vehicles.

Increases in total registration were reported from California, Connecticut, Maine, Maryland, Nevada, New Jersey, Oregon, Rhode Island, Virginia, Wyoming and the District of Columbia. The other states show decreases. Total truck registrations decreased only 0.6 per cent, and increases are shown in 23 states and the District of Columbia.

The total revenue of $344,337,654 derived from licenses, permits, etc., was allocated almost entirely for road building purposes and played an important part in the continuation of road construction. The allocation was as follows: State highways, $200,733,786; local roads, $70,043,625; payments on road bonds, $42,574,464; collection and administration, $19,688,604; other purposes, $11,549,697.

The total registrations and license revenue by states are as follows:

State	Grand Total Registered Motor Cars and Trucks 1931	Receipts from Licenses, Permits, Etc.
Alabama	246,465	$ 3,379,392
Arizona	105,572	767,508
Arkansas	180,731	3,495,545
Calif.	2,043,281	9,763,274
Colorado	308,458	1,910,741
Conn.	336,040	8,259,542
Delaware	55,202	1,043,173
Florida	323,260	4,851,968
Georgia	320,840	4,256,553
Idaho	111,663	1,909,363
Illinois	1,612,770	18,426,497
Indiana	862,672	6,332,101
Iowa	748,438	12,539,613
Kansas	559,176	6,059,910
Kentucky	327,326	4,842,108
Louisiana	263,050	4,549,244
Maine	188,238	3,184,091
Maryland	325,372	3,497,807
Mass.	840,190	7,000,306
Michigan	1,230,980	21,821,290
Minnesota	720,401	10,784,845
Mississippi	183,650	2,421,287
Missouri	752,805	10,140,429
Montana	127,166	1,499,492
Nebraska	416,131	3,742,401
Nevada	32,168	388,327
New Hamp.	111,510	2,257,459
New Jersey	869,867	15,891,204
New Mexico	81,325	1,248,097
New York	2,297,249	41,877,611
No. Car.	428,737	6,164,549
No. Dakota	171,293	1,799,120
Ohio	1,710,625	12,818,705
Oklahoma	482,725	5,857,107
Oregon	278,325	6,940,504
Penna.	1,741,942	31,607,172
Rhode Island	137,878	2,272,879
So. Car.	203,719	2,790,008
So. Dakota	193,025	2,808,172
Tennessee	350,520	4,580,685
Texas	1,297,301	13,994,647
Utah	108,958	828,303
Vermont	83,877	2,355,913
Virginia	379,227	6,159,257
Washington	420,878	7,623,570
W. Virginia	253,308	4,519,763
Wisconsin	754,249	11,724,995
Wyoming	62,101	727,667
Dist. of Col.	173,519	623,460
Total	25,814,103	$344,337,654

E. F. Co. Buys Process

SALEM, OHIO, April 21—The Electric Furnace Co. has purchased the business of the Process Engineering & Equipment Corp., Attleboro, Mass., builders of "Preeco" bright annealing and controlled atmosphere furnaces. All equipment, etc., of the Process Corp., has been moved to Salem, Ohio.

Dodge Deliveries Up

DETROIT, April 18—Figures compiled from wire reports from Dodge regional offices throughout the country show that total deliveries by Dodge dealers have increased each week over the previous week since March 12. The increase for the week ending March 19 was 14.8 per cent; for the week ending March 26, 17.8 per cent; for the week ending April 2, 3.4 per cent and for the week ending April 9, 22.9 per cent.

Bijur Elects Kocher

Edward H. Kocher has been elected president and general manager of the Bijur Lubricating Corp.

During the past few years Mr. Kocher has supervised all of the activities of the company, and has held the position of treasurer and manufacturing manager since its organization in 1922. For the past 26 years Mr. Kocher has been associated with the late Joseph Bijur in all of his enterprises.

More Mills Share Automotive Steel

Short Order Policy Prevents Backlog Formation; Cuts Profit

NEW YORK, April 21—Automotive demand for flat steel has gained further momentum and is chiefly responsible for resumption of operations at some of the Valley rolling mills and extension of schedules at others. Moderate improvement in buying has been in evidence for several weeks, but this demand was spread in the main among smaller mills and, therefore, did not come in for general recognition. Nevertheless it marked the beginning of the turn.

More mills shared in the business that has come out in the last few days, but even so there is still marked disparity in the industry as a whole and the gain in actual tonnage more reassuring because of the better trend than in itself impressive. The theory that unless there is a fair backlog it is cheaper to shut down than to run on from day-to-day specifications is receiving more or less of a jolt, as quite a few automotive orders within the last fortnight have gone to plants in operation because those that were down could not promise shipments within the brief interval which consumers are willing to grant these days.

Resumption of activities by some of the non-integrated sheet rollers has caused a revival in the market for semi-finished steel and some transactions in sheet bars are reported at $26, Cleveland or Youngstown. One of the non-integrated sheet rollers is reported to have resumed operations on a 75 cents capacity basis. Some improvement is noted in the Cleveland market for cold-finished steel bars and automotive alloy steels. Producers generally emphasize the market's stability. There is decided opposition among the smaller "independents" to any further downward revision of wage schedules at this time as it is feared that what savings might be effected by such a move would have to be passed on to the consumer and again upset the equilibrium.

Pig Iron—Several automotive foundries have made inquiries for round tonnages and Middle West sales agents feel much encouraged over the outlook for the remainder of the spring. In the Chicago market No. 2 foundry iron continues to be quoted at $16. Competition in all markets is keen and concessions not infrequent.

Aluminum—Secondary aluminum smelters have it that much of the 32 pounds of aluminum contained in each Ford unit will be supplied by remelters. The market for No. 12 remelted is quoted at 8 @ 9 cents. Quotations for virgin metal remain unchanged.

Copper—Electrolytic was still available at 5¾ cents delivered Connecticut Valley, at the beginning of the week although producers were naming 6 cents.

Tin—The market is a shade stronger, with Straits tin quoted at 19 cents on Monday.

January Gasoline Consumption Shows Large Indicated Drop

The figures below, which are based upon the quantity of gasoline sold or offered for sale, as reported by wholesalers and dealers in the states listed, under provisions of the gasoline tax or inspection laws, reflect, as nearly as it has been possible to obtain it, the consumption of gasoline during January, 1932, with previous month and year ago comparisons.

The figures herewith are fairly comparable, but it must be borne in mind that more or less widespread tax evasion and changes in the basic laws under which the figures were collected over the period compared, may have disturbed the comparability of the figures. It is, therefore, not correct to base percentage changes in demand upon the figures presented herewith.

All demand calculations used by the American Petroleum Institute are based upon Bureau of Mines monthly statistics, which are regarded as being more truly indicative of actual consumption. The figures set out below, represent a break-up, as nearly correct as it is is possible to obtain it, by states, of the total demand in the United States, as calculated from Bureau of Mines monthly statistics.

Gasoline Consumption by States, January, 1932

	Tax Per Gallon Cents	MONTH OF Dec., 1931 Gallons	Jan., 1932 Gallons	Jan., 1931 Gallons
Alabama	5	11,724,000	11,232,000	12,575,000
Arizona	5	6,056,000	5,509,000	5,850,000
Arkansas	6	.....	*(b)*	.....
California	3	105,407,000	102,210,000	100,740,000
Colorado	4	10,558,000	10,910,000	12,037,000
Connecticut	2	19,735,000	15,694,000	14,924,000
Delaware	3	2,917,000	2,851,000	2,258,000
District of Columbia	2	7,913,000	7,318,000	6,489,000
Florida	7	20,455,000	20,697,000	22,365,000
Georgia	6	17,704,000	16,733,000	17,093,000
Idaho	5	3,233,000	2,619,000	2,961,000
Illinois	3	91,947,000	67,403,000	65,609,000
Indiana	4	35,127,000	32,398,000	31,976,000
Iowa	3	27,121,000	24,227,000	27,814,000
Kansas	3	27,541,000	24,000,000	26,815,000
Kentucky	5	13,292,000	12,075,000	12,396,000
Louisiana	5	15,064,000	13,533,000	13,928,000
Maine	4	7,065,000	5,381,000	4,460,000
Maryland	4	14,604,000	12,955,000	12,337,000
Massachusetts	3	45,490,000	35,727,000	33,836,000
Michigan	3	61,589,000	56,036,000	54,272,000
Minnesota	3	27,434,000	26,039,000	28,269,000
Mississippi	5½	6,825,000	*(a)*7,760,000	8,083,000
Missouri	2	39,803,000	35,170,000	31,848,000
Montana	5	3,667,000	3,336,000	4,159,000
Nebraska	4	13,767,000	12,932,000	16,334,000
Nevada	4	1,571,000	1,318,000	1,131,000
New Hampshire	4	4,394,000	3,596,000	2,959,000
New Jersey	3	55,912,000	47,799,000	46,434,000
New Mexico	5	3,503,000	3,161,000	3,594,000
New York	2	123,640,000	105,664,000	98,946,000
North Carolina	6	23,011,000	22,309,000	21,050,000
North Dakota	3	4,654,000	3,722,000	6,298,000
Ohio	4	72,116,000	64,476,000	63,371,000
Oklahoma	4	21,571,000	21,287,000	24,510,000
Oregon	4	11,183,000	10,466,000	10,323,000
Pennsylvania	3	83,797,000	71,689,000	81,217,000
Rhode Island	2	7,831,000	7,044,000	6,006,000
South Carolina	6	9,790,000	8,282,000	8,987,000
South Dakota	4	7,153,000	5,832,000	8,906,000
Tennessee	7	17,266,000	15,236,000	15,215,000
Texas	4	62,325,000	54,999,000	61,059,000
Utah	4	3,465,000	3,506,000	3,800,000
Vermont	4	3,131,000	2,215,000	2,124,000
Virginia	5	20,049,000	16,464,000	15,658,000
Washington	5	19,668,000	15,289,000	18,912,000
West Virginia	4	10,983,000	8,275,000	8,060,000
Wisconsin	4	31,862,000	26,119,000	26,879,000
Wyoming	4	2,245,000	1,792,000	2,143,000
Total		1,237,158,000	1,085,285,000	1,107,010,000
Daily Average		39,908,000	35,009,000	35,710,000
Decrease from previous year:				
Amount of Decrease		.....	21,725,000	.....
Percentage decrease in Daily Average		.....	1.96%	.....

(*a*)—Estimated. (*b*)—Not available on date of publication.

Widman Leaves Cadillac

Lawrence P. Fisher, president of Cadillac Motor Car Co., has announced the resignation of A. U. Widman, Cadillac works manager for the past ten years. The resignation is effective May 1. After a vacation of several months Mr. Widman will return to Detroit and devote his entire time to personal interests.

In making the announcement Mr. Fisher expressed regret in accepting the resignation and stated that no successor had been determined upon at this time.

Mr. Widman joined Cadillac in 1914, previous to which he was treasurer and general manager of the Auto Parts Mfg. Co., Detroit.

He was appointed assistant production manager of Cadillac in 1916, and two years later became production manager. In 1920 he was made assistant works manager and the following year assumed his present position.

Michigan Employment Off

DETROIT, April 19—Employment in the automobile industry in the state of Michigan during March totaled 161,155, as compared with 166,572 in February and 193,193 in March, 1931. These figures are based on the reports of 75 companies and obtained from the State Department of Labor and Industry.

The aggregate weekly payroll for March was $3,633,532, $4,283,238 in February and $5,613,810 in March last year.

Average weekly earnings per capita were $22.55 in March, $25.71 in February and $29.06 in March, 1931.

Technical Dictionary Has New Edition

NEW YORK, April 18—The Industrial Press, New York, has announced publication in Berlin of a new and enlarged edition of the Hoyer-Kreuter technical dictionary. The work, which is in three volumes, has vocabularies in German, English, and French, each volume giving primary place to one of the three languages, and giving equivalents for it in the other two. Verlag von Julius Springer is the German publisher, and the Industrial Press is American representative for distribution of the Hoyer-Kreuter dictionary.

Machine-Tool Men Meet in Toledo

COLUMBUS, OHIO, April 18—Influenced by the fact that there will be completed in Cleveland in 1933 a new auditorium capable of handling under one roof a composite machine-tool show, and by the fact that the Century of Progress Exposition in Chicago will bring into the United States a host of foreign technicians, the National Machine Tool Builders Association has decided to postpone its show scheduled for September of 1932 to September of 1933. Existing contracts with the Cleveland Auditorium and the show manager will be carried over. These decisions were reached at the spring meeting of the association held in Columbus April 11 and 12.

Formal business of the meeting included a presidential address by Robert M. Gaylord, president of the Ingersoll Milling Machine Co.; treasurer's report by George E. Randles, president of the Foote-Burt Co.; and the first statement since he has taken office by Boyd Fisher, the new general manager of the association. Ralph Flander, a past-president of the association, spoke in a humorous vein on a "Rummage Sale of Outworn Ideas." A resolution of tribute to the late Carl L. Johnson, the most recent past-president of the association, was prepared.

Ford of Canada Surplus Declines

EAST WINDSOR, ONT., April 18—A reduction in surplus during 1931 aggregating $3,672,702 was reported today by the Ford Motor Co. of Canada, Ltd., in its annual report to shareholders. The company's surplus on Dec. 31, 1931, was $24,764,262 as against $28,436,956.26 at the close of 1930. The reduction was accounted for principally by a net loss for the year of $1,384,757 a total dividend disbursement of $996,376 and $1,250,000 transferred to the reserve for investment in affiliated companies and contingencies. The report noted that the reserve of $3,250,000 at the end of the year is "sufficient to provide for impairment of capital of affiliated companies and depreciation in foreign exchange as at Dec. 31, 1931." The company's total sales and other income, it was reported, amounted to $21,596,851. The amount of capital stock outstanding was reported unchanged from last year, the total being 1,588,960 shares of Class A non-voting stock and 700,000 shares of Class B voting stock. The annual meeting of shareholders will be held April 25.

New Stinson Ready June 1

WAYNE, MICH., April 20—First deliveries of the new Stinson ten-passenger, two-pilot, tri-motored transport plane, which was given its initial showing at the National Aircraft Show in Detroit earlier in the month, will be made June 1, according to L. B. Manning, president of the Stinson Aircraft Corporation. This plane is priced at $22,900.

Hudson Buys From 449 Firms

DETROIT, April 21—The Hudson Motor Car Co. today announced that it purchases parts going into the manufacture of Hudson and Essex automobiles from 449 firms in 148 cities located in 20 states and in Canada. A breakdown of Hudson's announcement shows materials purchased in the following states:

State	No. Firms	No. Cities
Michigan	169	25
Ohio	84	23
Pennsylvania	34	18
New England (5 states)	34	21
Illinois	29	8
Wisconsin	24	6
Canada	22	10
New York	21	11
Indiana	13	12
South (5 states)	8	8
New Jersey	8	4
Missouri	2	1
Delaware	1	1

Champion Expects Increase

TOLEDO, April 19—R. A. Stranahan, president of the Champion Spark Plug Co., said new type plug designed to better control heat is already showing results and assures the company of heaviest employment and purchasing schedule in its history in 1932 and 1933.

City Auto Reelects

TOLEDO, April 18—Stockholders of City Auto Stamping Co. at the annual meeting reelected all officers and directors. Amos Lint, president, reported a gain in automotive die business, but lethargy in production of stampings.

Steel Price Cuts Sought By Big Automobile Maker

PHILADELPHIA, April 20—Inquiry among Eastern steel mills has revealed that a leading manufacturer of low-priced automobiles has been in the market seeking sharp price concessions on large tonnages. Such price concessions have been largely refused, and it is the sentiment among steel suppliers that the present market on the items sought will be broadly maintained.

Federal Truck Adds Companion Line

As a companion to its present line of F-7, 1¾-ton four-wheel trucks, Federal Motor Truck Co., has recently placed on the market the F-8, similar in basic design but intended for slightly higher tonnage ranges, from 1¾ to 2 tons, and incorporating a number of improvements and refinements, as compared with the F-7.

Powerplants, including transmissions, are the same as on the F-7, as are frames. In addition to the regulation springs, there are also found on the F-8 auxiliary springs at the rear, 41 in. long and a-½ in. wide, there being 4 leaves.

Together with axle changes, etc., this is effective in providing a gross rating capacity of 11,500 lb. as against 10,000 for the F-7, for a chassis weight increase of only 100 lb. List price is only $100 higher at $1,425.

Important in the new truck are wider axles both front and rear. Of Timken manufacture, these have tracks of 61 in. at the front, reflected in sharper turning radius and 64¼ in. at the rear, thereby enabling an increased body width between wheel-housings on panel bodies. At the same time the new axles also are designed for a higher road clearance, without increasing the height of the frame from the ground. Road clearance at the front is 10 in., and at the rear 9 in.

The wider tread moreover permits of larger brake drums and on the F-8 these are 2¼ in. wide. Standard ratio for the F-8 rear axle is 6 4/5 to one as against 5 5/6 for the F-7. The same ratios available on the F-7 are also offered optionally on the F-8, however.

Governed speed on the F-8 Continental 16-C engine has been raised slightly to 2600 r.p.m., equivalent to a governed top speed of 36 m.p.h. with the standard gear ratio.

Minor engine improvements also to be found on this new truck include the adoption as standard equipment of an oil filter, an increase in battery size to 133 amp. hr. and the provision of automatic lubrication for the fan-shaft bearing.

S.A.E. Names W. E. John

William E. John, manager of the New York office of the Sterling Engine Co., has been named vice-chairman, marine activity, of the Metropolitan Section, Society of Automotive Engineers. Creation of the marine division of the Met Section was recently authorized by the S.A.E. Council.

Sparton Appoints Holmes

G. A. Holmes has been appointed general manager of Sparton of Canada, Ltd., London, Ont. Mr. Holmes is a Canadian who has been connected with various Dodge plants in the United States, and who joined the Sparton organization early this year.

Present Congress May Consider Regulation of Carriers Following I.C.C. Report

WASHINGTON, April 21—The recommendation of the Interstate Commerce Commission for Federal regulation of interstate motor buses and trucks announced in its report last Monday was immediately followed by a statement by Representative Rayburn of Texas, chairman of the House Committee on Interstate and Foreign Commerce, that the committee would consider bus and truck legislation as soon as it disposes of pending railroad-holding legislation. The report on the latter is in early prospect.

Whether or not the announcement of Representative Rayburn means the decision of the commission has speeded up the committee's plan for considering bus and truck legislation, it reflects a change from previous plans of the committee. Originally, it was the purpose of Representative Rayburn to await action by the Senate on the bus and truck bills for regulation of highway traffic. These are known as the Couzens bills which recently were the object of extensive hearings before the Senate Committee on Interstate Commerce, of which Senator Couzens of Michigan is chairman. It was the general view that these bills would not be enacted at the present session. There has been doubt that they would be reported to the Senate. It was particularly the view that no regulation of motor trucks would be sought. It is still believed this is the situation, though in some quarters suggestions have been made that the commission's report may bring an early report to the Senate with renewed efforts to enact motor bus regulation. On the House side, Representative Rayburn appears to be providing for quickened action since he has changed plans as to awaiting action by the Senate. Truck regulation for the present, if at all provided for through legislation, promises to be of a more limited character than would be bus regulation, the commission's report, as a matter of fact, proposing approach to complete truck legislation by degrees. The commission makes no recommendation for the control of regulation of truck rates and in this as in numerous other respects differs from the tentative report of Examiner Flynn on the much discussed subject of Coordination of Motor Transportation.

The commission's numerous recommendations represent renewed or modified suggestions for legislation made in its annual reports, particularly the latest annual report.

Federal regulation of interstate bus and common and contract-carrier trucks is held to be in the public interest to "restrain competition within reasonable limits, encourage desirable coordination and stabilize rates and financial conditions." It is declared that contract and common carriers should be treated separately. This, it is said, is due to the fact that "it is no longer open to doubt that, consistent with due process of law, a contract carrier can not be converted by mere legislative command or be regulated as such."

Specific matters in connection with the commission's regulation would be delegated to state boards.

Proposals of the commission include:

Renewed recommendation of 1928 for complete regulation of motor bus operations.

For-hire truckers would be divided into common carriers (anywhere for-hire) and contract. If common carriers, they would be required to (a) obtain a permit, and (b) carry liability insurance that will insure adequate protection for loss or damage to cargo and for personal injuries and property damage. Except that they would not be required to carry cargo insurance, contract carriers would be subject to the same regulation as common carriers.

States would be permitted to determine for the present least requirements as to drivers, hours or service, size, weight and speed of vehicles.

Interstate Commerce Act would be applied to forwarding and express-freight companies.

Permission, with no requirement, would be granted to establish through-routes and joint-rates between rail, water and highway carriers.

Congress is asked to undertake an impartial study as to subsidies and uniformity of vehicle regulations.

Commissioners Lewis and McManamy concurred in part in the majority report but suggested certain alternative plans regarding some phases of regulation.

Offers Technical Employment Service

The Engineers Club of Philadelphia, together with the affiliated Engineering Societies, has organized the Philadelphia Technical Service Committee for the purpose of bringing together the executive requiring technical assistance and the unemployed engineer.

Over 500 competent, trained men are at present registered with this committee. The list covers a wide range of activities, and includes executives, plant managers, production engineers, process technicians, as well as salesmen, purchasing agents, designers, draughtsmen, chemists, etc.

Manufacturers and others needing such assistance may communicate with the committee at the Engineers Club, 1317 Spruce St., Philadelphia, Pa.

Reo Elects Foster

Walter S. Foster has been elected a director of the Reo Motor Car Co., Lansing, Mich., succeeding William Robert Wilson, resigned. Mr. Foster, a member of Lansing's leading law firm, has been Reo's counsel for many years.

+ + CALENDAR OF COMING EVENTS + +

FOREIGN SHOWS

Tel. Aviv, Palestine (Levant Fair) ..... April 7-30
Milan, International Automobile Salon ..... April 12-27
Zagreb, Jugoslavia, Automobile Salon ..... April 23-May 2
Peznan, Poland, International Fair ..... May 1- 8
Dublin, Commercial ..... May 4- 7
Budapest, International Fair ..... May 7-16
Belfast, Commercial ..... May 25-28
Bordeaux, Fair ..... June
Cork, Commercial ..... June
Inverness, Commercial ..... June 21-24
Southampton, Commercial ..... July 5- 9
Llandrindod, Wales, Commercial ..... July 20-22
London, Olympia Show ..... Oct. 13-22
Glasgow, Scottish Motor Show ..... Nov. 11-19

CONVENTIONS

American Welding Society, Annual Meeting, New York City ..... April 27-29
American Society Mechanical Engineers (Management Div.) Philadelphia ..... May 2- 6
American Soc. Mec. Engineers, Detroit ..... May 4- 5
American Gear Mfrs. Assn., Sixteenth Annual Meeting, Cleveland ..... May 12-13
U. S. Chamber of Commerce, San Francisco, Cal. ..... May 16-20
National Battery Mfrs. Assn., Chicago, Ill. ..... May 19-20
Automotive Engine Rebuilders Assoc., Indianapolis ..... May 30-June 2
American Soc. Mechanical Eng. (Natl. Aeronautic Meeting) Buffalo ..... June 6- 8
American Soc. Mec. Eng. (Natl. Oil & Gas Meeting) State College, Pa. ..... June 8-11
Pacific Coast Aero. Meeting (A. S. M. E.), Berkeley, Calif. ..... June 9-10
Soc. of Automotive Engineers, White Sulphur Springs, (Summer meeting) ..... June 12-17
Amer. Soc. Mechanical Engineers, Bigwin, Canada, (Semi-Annual Meeting) ..... June 27-30
National Team & Motor Truck Owners Assn., Detroit ..... July 17-19
American Society Mechanical Engineers, Cleveland, O., (Machine shop practice meeting) ..... Sept. 12-17
National Safety Council, Washington, D. C. ..... Oct. 3- 7
American Society Mechanical Engineers, Buffalo, N. Y., (Natl. Iron and Steel meeting) ..... Oct. 3- 8
S. A. E., Annual Transportation Meeting, Toronto ..... Oct. 4- 6
American Society Mechanical Engineers, New York City, (Annual meeting) ..... Dec. 5- 9

RACES

Indianapolis ..... May 30
Detroit ..... June 5
Altoona ..... June 12
Roby, Ind. ..... June 19
Altoona ..... Sept. 5

YOUR Sales Department NEEDS

in this year

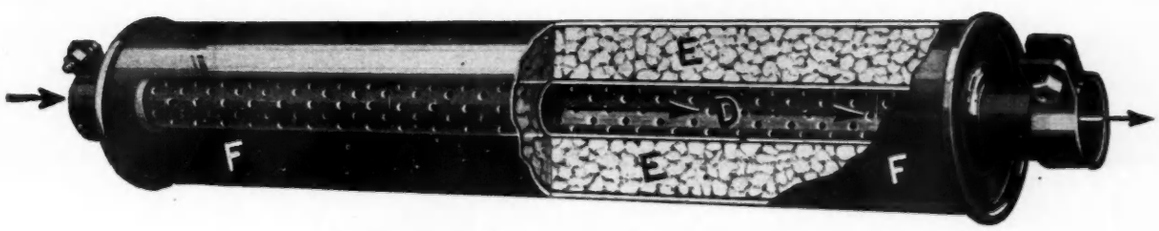
When the Future Sale Supremacy of Many Cars Will Be Decided

The Extra Advantages Offered Exclusively By

BURGESS

"Straight-Thru" Mufflers and Intake Silencers:

Quieter—Reduced Back-Pressure—No Power Loss—More Speed



As illustrated above, the Burgess Muffler consists of three principal parts: a straight open perforated pipe, D, surrounded by a sound-absorbing material, E, which is enclosed in a metal covering, F. The exhaust gases from the engine pass straight through the perforated pipe, D, but the exhaust noises are absorbed, assuring satisfactory muffling.

BURGESS BATTERY COMPANY

ACOUSTIC DIVISION, MADISON, WISCONSIN
DETROIT ADDRESS: 542 NEW CENTER BUILDING

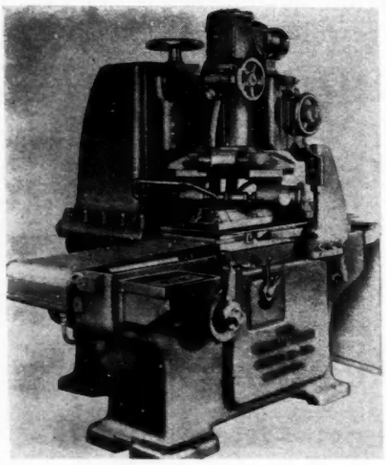
ENGINEERS AND MANUFACTURERS OF ELECTRIC AND ACOUSTIC PRODUCTS

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

Michigan Gear Finishing Machine

The latest entry in the field of automotive gear finishing is the Michigan Tool Co., Detroit, Mich., with a decidedly novel machine designed to accurate finish spur or helical gears in the soft state. Its maximum capacity is 8 in. O.D. and 6 D.P.

The unique feature is an involute rack made up of separate sections,



about which the gear is rolled to the required finish and accuracy. It is completely controlled by a hydraulic Oilgear unit. High pressure is used for the power on the table travel. A low-pressure cylinder which is mounted on top of the head is used for raising and lowering the head of the machine and to lock the machine to the correct finishing dimension while the gear is finished.

It is so constructed that the head is fed into the gear under a certain pressure, such that if a gear is mounted in the machine with an excessive amount of stock, it will not break the cutting rack or stall the machine.

The table makes a certain number of strokes, which are predetermined, and are available from one to 50, depending upon the size of the gear to be finished. After the predetermined number of strokes have been run, the head automatically raises and the table stops so the operator may remove the finished gear and insert another one for the operation.

For estimating purposes the production time of a 28-tooth, 10-pitch gear, 40 deg. helix angle, ¾-in. face, with 0.004 in. to 0.008 in. stock on tooth thickness, is 60 per hr., or 1 per min. The limits on these gears are 0.0015 in. eccentricity, 0.0002 in. on involute, 0.0002 per in. on helix angle, 0.0002 in. on spacing from tooth to tooth, with at least an 85 per cent of full contact of tooth form.

Drive is from a 5-hp. motor mounted at the side, and transmitting power to the Oilgear mechanism through a Texrope belting. Floor space is about 6 by 7 ft. Net weight, 7000 lb.

Aetna Oil Seal

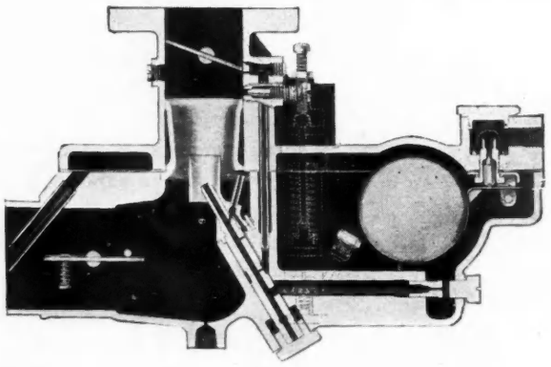
A new product of the Aetna Ball Bearing Manufacturing Co. of Chicago, the Aetna oil seal, is a self-contained unit which can be slipped in or out of position. It consists of four parts, namely, an outer shell of steel, accurately formed and ground on the outside diameter; and a seal cushion, pressure plate and steel retainer, the latter three being housed inside the first mentioned. The thermo-pneumatic seal cushion consists of treated cork in which the interstices or air cells are hermetically sealed. This pneumatic seal cushion is said to expand and contract laterally with changes in the temperature of the shaft or the lubricant, and this is claimed to assure oil-tightness under all conditions. The seal is said to be non-hygroscopic and impervious,

to be highly resilient, to have a low coefficient of friction, and to be resistant to abrasives. The deflector pressure plate, of dense fiber, deflects oil from the seal proper, serving to maintain a steady pressure upon the cushion and a uniform pressure over the entire periphery of the seal, while relieving it of extraneous internal pressure. In this way the pneumatic seal is said to be maintained always concentric with the shaft and relieved of longitudinal pressure, which is said to be a prolific source of failure of oil seals.

(Turn to page 644, please)

Stromberg SF Carburetor

A new type heavy-duty carburetor has been placed in production at the South Bend plant of the Bendix Stromberg Carburetor Co., which is said to be adaptable to trucks, buses, tractors and industrial engines regardless of size and number of cylinders.



This carburetor, which is known as the SF type, is made in five sizes, all models being of single-barrel construction, with diameters of 1, 1¼, 1½, 1¾ and 2 in. The carburetor is of the plain-tube type and incorporates the Stromberg double-venturi principle. The float chamber is on one side; the float is of the hinged type, and the fuel enters the float chamber on top through the float-controlled needle valve. Air bleeds and the float-chamber vent are through the air horn, to prevent dirt from getting into the carburetor, which is completelv sealed.

Oil can't keep squeaks . . or owners . . quiet permanently

A squirt of oil on a body joint will silence a squeak — temporarily. But the squeak will come back — and so will the owner. And the more complaints the owner has from body noises, the better prospect he becomes for another make of car.

. . .

When an automobile body has no joints, there can be no squeaks — no rattles. Budd has eliminated joints by eliminating parts, and by the extensive use of flash-welding. The Budd All-Steel one-piece body is made of only eight major parts — flash-welded into a single jointless unit.

Originated by Budd engineers, this one-piece construction assures greater strength and greater safety — it makes possible a degree of silence unequaled in any other type of body. Automobile service men prefer the Budd one-piece body because it eliminates service costs on "squeaks and squawks." Automobile salesmen prefer it because its permanent quietness helps to keep cars sold.

★ BODIES BY BUDD ★

Originators of the All-Steel Body. Supplied to Manufacturers in the United States, Great Britain, France and Germany

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

Matthews Conveyor Uses Own Device

A practical test has been made applying three pairs of Mathews ball transfers originally described in *Automotive Industries*, July 25, 1931, in such a position as to handle various diameter rounds and tubing for feeding a cut-off machine. This test, now six months old, has proven so successful that the manufacturers, the Mathews Conveyor Co., Ellwood City, Pa., have decided to pass this feature along to other interested people.

Two types of Ball Transfers are available. Type 202 for medium size rounds or tubing arranging from 1 in. to 3 in. O.D., and Type 500 for heavier stock ranging from 3 in. to 8 in. O.D.

Supports or stands can be designed in several different arrangements; for example, a pipe leg set in a heavy base with the ball transfers mounted

on top, set at an angle to suit the size of stock to be handled, is one method.

Another is to use structural angle members welded together and arranged for mounting the ball transfers at suitable angle. It is also possible to use separate vertical pipe standards, bent at the top end so as to mount the ball transfers at suitable angle.

Champion Shielded Aircraft Spark Plug

The latest addition to the line of spark plugs of the Champion Spark Plug Co., Toledo, Ohio, is the Aero RA plug for aircraft engines. Its radio dome shield is said to be an effective protection against short-circuiting caused by dirt, rain, ice or oil, and its grounded construction to eliminate radio interference and to guard against breakage or injury caused by foreign objects coming in contact with the plug. The small bore makes it possible to use the Aero RA in practically all radial air-cooled and high-compression water-cooled engines. The plug is made up of two units—the shield assembly and the base (plug) assembly, and either part can be bought separately if needed.

New Cincinnati 4-Position Turret Stop

The Cincinnati Milling Machine Co., Cincinnati, Ohio, now offers as regular equipment a 4-position turret stop and dial indicator arrangement for use with its vertical Knee and Column Type Millers, sizes 1, 2 and 3.

It provides quick, accurate setting of spindle to various positions for step milling. Jig boring and die sinking can now be performed more advantageously on Knee and Column Type Millers.

The turret with four adjustable stops is easily turned by hand in either direction. With this arrangement power feed to head is automatically disengaged when the different stops strike the plunger at the time the cutter is within a few thousandths of desired depth. Final setting is made by hand and noting reading on dial indicator.

Square gibbing and narrow guides insure positive alignment of head in any position. A small hand lever on left side of head provides fast positive clamping. Spindle alignment is not affected by clamping or unclamping of head.

Cromaloy Flux

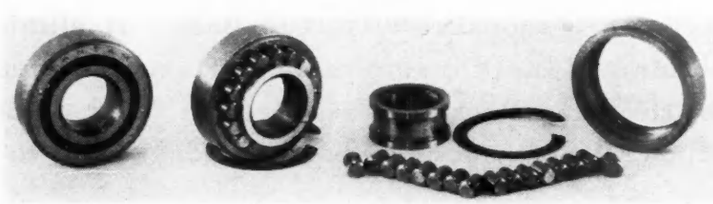
Cromaloy flux, one item in the line of Oxweld welding fluxes distributed by the Linde Air Products Co., New York, has been developed especially for use in welding the rustless steels.

Ordinary fluxes used for welding or brazing are not satisfactory in welding rustless steel because they will not dissolve the infusible oxides, consisting chiefly of chromium oxide, which tend to form on the molten surface of these alloys. A satisfactory flux for use in welding these alloys must be sufficiently fireproof to protect the molten metal and hot metal adjacent to the weld from oxidation, and at the same time correctly compounded to dissolve the refractory chromium oxide with ease.

Because of its high solvent power for chromium oxide, and its high resistance to heat, Cromaloy flux is especially prepared for this type of work, and its use is said to insure good results.

Bantam Roller Bearings for Generators

A radial roller bearing for automobile generators has been brought out by the Bantam Ball Bearing Co., South Bend., Ind. It has a full complement of rollers and is designed to take thrust load in one direction. In the No. 203 size of bearing there are 16 rollers, instead of the eight balls in the same size bearing of the ball type, and the load capacity is said to be eight times that of the No. 203 ball bearing.



This large capacity for radial bearing loads is said to be particularly desirable in a generator with belt drive, in which the bearing load depends on the belt tension, and is always greater than in an equivalent shaft-driven generator.

It is claimed for the roller bearing that it will outlast the car on which it is used, and that it is more quiet in operation than a ball bearing. Races as well as rollers are made of alloy steel, and the tolerances are the same as specified for ball bearings, hence these bearings are interchangeable with ball bearings.